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Electrical World

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An Engineer at Last

WHILE the Governor of the State of New York may not have had in mind any distinct tribute to the engineering profession, his appointment of Lewis Nixon as head of the Public Service Commission, First District, and his desire to make William Barclay Parsons responsible for the construction functions of the commission constitute a notable recognition of the engineer in public affairs. Both men have reached a position of eminence in their respective professions, and the fact that Mr. Parsons has declined to serve merely shifts the regulatory and construction burdens on to the shoulders of Mr. Nixon. To engineers as well as the general public Mr. Nixon's appointment will commend itself. He is a graduate of Annapolis, a famous shipbuilder and designer, a captain of industry and was Commissioner of Public Works of the State of New York at the time of his appointment. Whether or not he is skilled in the particular branches of engineering with which public service commissions are mostly concerned matters not. It suffices that he is an engineer with experience in governmental work. Without reflecting in the least on the public service commissioners who have previously served the State of New York, we are inclined to the belief that an engineer rather than a lawyer can give the more excellent and satisfactory account of his stewardship.

The advocates of government ownership are astonished at the lamentable failure of the wire and rail operations; but what else is to be expected? Would experience and modern history indicate any other results?

Agreement with Labor

IF LABOR is a factor which must be dealt with on an industrial basis, the sooner employers understand labor the better. Certainly there is a new spirit toward labor manifesting itself throughout the world, and labor for its part is beginning to appreciate that its interests and those of employers are identical. But if they remain apart mutual understanding is impossible and maximum coöperation is not attained. A long step toward eradicating labor misunderstandings has been taken by the Conference Club and the International Brotherhood of Electrical Workers. Representatives of both organizations have mingled in conference out of which has been evolved a declaration of purposes tantamount to a national agreement, mutually satisfactory to both sides and of advantage to the electrical industry and the general public. If this code of principles is finally adopted by the International Brotherhood of Electrical Workers and the electrical contractors, there will be no stoppage of work unless one side or the other becomes dishonest. Mistakes, of course, are liable to happen in all organizations through honest intentions, but a means of adjudicating these differences will be provided without cessation of work and without inconvenience to the general public. Therein lies the advantage of the agreement. If both parties to the understanding are honest with each other and mutual confidence can be maintained, the result is bound to be beneficial. The rest of the electrical industry will watch with interest the working out of this copartnership between the electrical contractors and the International Brotherhood of Electrical Workers, of which much that is excellent is expected.

Commercial men in large numbers are to be found at almost every convention, but employers will reap rewards as great if not greater if they encourage their engineers to go as well. The latter need the broadening influence which comes from contact with men more than do the former.

A Historic Case

THE Supreme Court of the United States this week sat in a case involving two great public utilities which is destined to become historic. "Can the federal government take from the states the control of rates charged for public utilities in their territory?" This, in brief, is the issue in the case of thirty-eight states at bar as appellants against the United States Post Office Department and the United States Railroad Administration as respondents. The contention is that interstate commerce alone is within federal jurisdiction and that meddling with wire rates and railroad tariffs within a state contravenes the police powers of that state. The government holds that executive departments are exempt from court determination of the legality of what they may do and that no suit against the government is possible without its consent. It remains, however, for the Supreme Court to say if in a government of laws there is no remedy for the unsatisfactory condition now existing in our communication and railroad systems. The public is little interested in the Postmaster-General or the Director General of Railroads as individuals, but is vitally concerned in the kind of telegraph, telephone and railroad service it is to receive, the price it has to pay for that service, and the character and development of the communication and railroad interests in the future. If government ownership of these corporations had been a manifest success, the demand for government ownership would have been so strong that it could not be resisted. But there has been no such success. Instead, we have indifferent service at increased rates, and in the case of the Railroad Administration the country faces a yearly

deficit of more than half a billion dollars. On the outcome of the case will depend whether or not our present system of public regulation is to prevail or go entirely to smash. When thirty-eight states are moved to seek a remedy from the Supreme Court the situation must be serious.

The nation is confronted with an enormous war debt, but it has been estimated that a thorough interconnection of electric utilities in New England and the electrification of railways and industries would effect savings amounting to many billions yearly. Such a saving is certainly worth while making.

The City of Electric Service

A FEW years ago word came from Switzerland of an enterprising little village among the mountains, renowned as a health resort, in which the progressive people had abolished the use of fuel and the whole service of the community had been turned over to electricity, clearing away the last trace of smoke from the weary traveler's contemplation and leaving him free from at least some of the evils of civilization while possessing all its benefits. New York City has just seen the opening to public convenience of an electrically served community on a vastly larger scale, truly a roofed-in city in its magnitude. The Hotel Pennsylvania, the largest hostelry in the world, is especially notable for the wonderful completeness of its electrical equipment and for the fact that it is served by an external heating plant and a distant power station adequate to meet its entire needs. The fundamental principle carried out in the equipment of this immense addition to the accommodation of the traveler was that the whole building should be cleared of the trouble of a localized heating equipment and should be provided with an electric service as near to absolute reliability as is humanly possible.

The requirements of the building are truly enormous. For heating purposes it is estimated that nearly a quarter of a billion pounds of steam will be required annually and somewhere around 5,000,000 kw.-hr. of electrical energy—more than the output required for many a small city. To find an adequate source for these supplies outside the building was no easy matter. There was not a little to be said for the construction of an independent isolated steam and power plant; for a hotel load, with its relatively long hours of service and its great requirement for steam outside of prime movers, affords an unusually favorable opportunity for economic generation of power. The local central station could not furnish the necessary steam, and there was a question whether it would be able to furnish electricity at a rate which would in the long run prove profitable. In the final resort both steam and electricity were purchased from the Pennsylvania Railroad, the electricity from the great Long Island City generating station, the live steam from the Pennsylvania Terminal across the way. Inasmuch as large amounts of steam are required at all times for heating purposes and the live steam supply must in any event be reduced in pressure for heating, this supply was utilized as an independent source of electric power, a 500-kw. engine-driven generator being installed as a reducing valve.

This equipment is big enough to furnish emergency lighting for the hotel and can be run practically at full load in cold weather and effectively utilized in connection with the transmitted supply of power at all times. This latter is delivered to the sub-basement substation at 11,000 volts, three-phase, 60 cycles. The substation contains two sets of transformers, one for the regular lighting service, the other for three synchronous converters, feeding the motor equipment requiring a special speed control. These rotaries are operated in parallel with the engine-driven generator, dividing the load unit as conditions require.

Care has been taken with the lighting distribution to insure adequate emergency lighting. The various lighting circuits are distributed among the three phases in approximate balance, but some of the corridor lamps and lamps at other important points are fed from each of the three phases, so that nothing short of a complete failure of the alternating-current supply can put them out of service, and in that case they can be immediately transferred to the direct-current supply. The illumination of the public portions of the building is most effectively designed. We know of no building in which the electrical equipment has been carried out more thoroughly and effectively than here and the whole plan of the installation does credit to this most notable addition to the hotel accommodations of the metropolis.

In some cases closer operating relations between central electric stations in nearby cities or districts will be developed through interconnection; in other cases consolidation of the physical assets of the companies will be arranged. Either form of operating unification will mean economy, which is conservation and is in the ultimate interest of the communities.

The 60,000-Kw. Interborough Generator

IN THIS issue details of operation are given of the 60,000-kw. three-cylinder, cross-compound turbo-generator in the Seventy-fourth Street station of the Interborough Rapid Transit Company by W. S. Finlay, Jr., the superintendent of motive power. The cross-compound turbo-generator is now comparatively familiar. Three of this class, of 30,000 kw. rating, have already for several years been in use in the Interborough power station. These were, however, two-cylinder units, so called, consisting of two turbines, one high-pressure and one low-pressure, the former exhausting into the latter, operated without mechanical connection, through electrical coupling of the generator ends. These earlier units were designed for different rotative speed in the two cylinders, the high-pressure units operating at 1500 r.p.m., the low-pressure ones at 750 r.p.m. The new 60,000-kw. turbine is somewhat different in arrangement and very different in some of the details. It consists of one high-pressure and two low-pressure turbines, each of the same rated capacity and arranged so that the high-pressure unit exhausts into both the low-pressure cylinders. All three are of the same rotative speed, 1500 r.p.m., and are of the pure reaction type of turbine, a construction which lends itself particularly to the design on account of the very large quantities of steam to be handled.

The high-pressure cylinder is of the ordinary single-flow construction, the steam entering at one end and leaving at the other, while the low-pressure cylinders are arranged for modified double flow, with the steam entering near the center, flowing as a whole through

part of the blading, and then dividing in opposite directions through the rest of the unit to the condensers. The high-pressure cylinder takes steam at 205 lb. per square inch (14.35 kg. per sq.cm.) gage pressure, superheated 150 deg. Fahr. (83 deg. C.), while the condensers are arranged for 29-in. (736-mm.) vacuum. Each cylinder is connected to its own generator of 20,000-kw. continuous capacity, three-phase, 11,000 volts and 25 cycles. Each element has its own busbars with separate feeders and reactance coils between the busbars to limit the current flowing between the generators. The connections are so arranged that each element can be operated separately or any necessary combination can be made. In practice the three generator switches are closed in starting, and the unit is brought up to speed as a whole. The total continuous capacity of the combined unit is 60,000 kw. for continuous service, or 70,000 kw. for two hours' operation.

Perhaps of even greater interest than the size and structure of this huge machine are some of the details of construction and operation. The matter of foundations alone was one which required serious thought. The foundation for each element was structurally isolated from the others, and the surrounding floor merely rests on the foundations without solid fastening. The very great amount of steam to be dealt with considerably complicated the matter of proper piping both to take care of expansion and to eliminate interference with proper facilities of operation and inspection or to reduce or remove the piping from the working area. For instance, the high-pressure steam piping was divided into two separate and individual lines, and the circulating-water piping was laid in trenches filled with concrete, but flexibility as regards its slight but measurable expansion and contraction was secured by wrapping the pipes with heavy paper before filling in, while the joints were left in pockets filled with coal tar and afterward flowed over with cement. There is thus left a considerable degree of plastic flexibility combined with the resisting power of the concrete filling. An absolutely unique feature of this type of engineering was substitution of jacketed steel and rubber expansion joints on the turbine exhaust, dispensing with the ordinary copper joint.

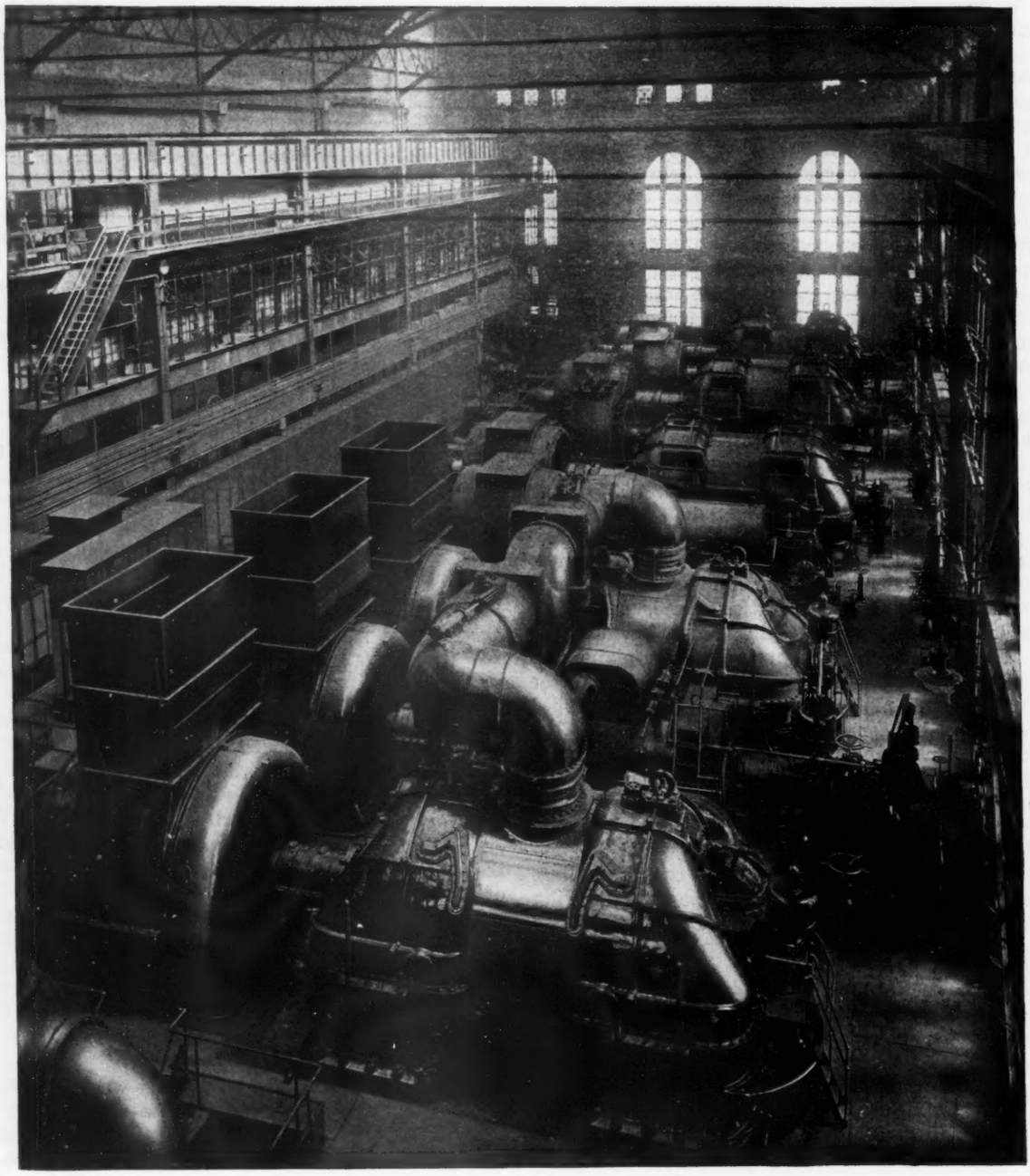
Perhaps the most ingenious feature of the whole installation is the automatic governing for the three cylinders. This is carried out with extraordinary completeness in spite of the fact that there are the usual means for manually handling the elements. If the high-pressure element is for any cause suddenly shut down, the two low-pressure cylinders automatically get steam direct from the boilers and hold up the load. Similarly, if the low-pressure elements are shut down from any cause not affecting the high-pressure cylinder, the latter will continue working and exhaust into the atmosphere, while if only one low-pressure cylinder goes out of service the high-pressure turbine will exhaust into the remaining low-pressure one. Each unit has an overspeed stop governor to cut off the steam when the load is lost. The regular high-pressure governor is adjusted for close speed control, about 3 per cent for the total range, and the governors of the low-pressure cylinders are arranged to be subordinated to the general governor system so that they will not tend to interfere or hunt. The details of the governor system are particularly instructive because they show to what extent the operation of a three-unit turbine can be made substantially automatic. So thoroughly has the scheme of governing been worked out that every ordinary contingency of service seems to be provided for by the mechanism with almost human intelligence. The advantage of these great multiple cylinder turbines over entirely independent units is considerable. The design is on the whole not complicated; the steam economy is quite as good as if the units were mechanically coupled and materially greater than if three entirely independent units were provided, while the electrical flexibility of the system certainly leaves very little to be desired.

Modern achievements of wireless telephony should recommend its use to many transmission companies. Storms which are violent enough to bring down heavy transmission circuits usually carry away the telephone circuits also, but with wireless telephony operators and linemen can communicate with headquarters and service can be quickly restored.

The Pull-Together in California

IT WAS a victory convention that the Pacific Coast Section of the National Electric Light Association and other branches of the industry held last week at Coronado, Cal. It had the consciousness of industry service to the nation in the time of peril, of an ever-growing obligation to meet the requirements which fall upon the electric utility, and of the need for substantial enlargement of plant facilities to provide for the future. The tendency was to look well ahead in forecast and to prepare for the big-scale development which is clearly foreseen during the years to come. California is progressive. Its survey of the growth of the industry in the post-war era is optimistic. Based on the tremendous development of the past, the spirit of enterprise sees new opportunity for large service in the years of upbuilding which lie just ahead. In every way the Western Coast companies have tried to weld all branches of the industry together to work for the greatest measure of this assured development. It is an evidence of this that is shown by the third joint convention of representatives of central station, manufacturer, jobber and contractor-dealer. Not only have all branches of the industry got together but each one had a share in the plans. By following this course the Pacific Coast industries have secured a superior degree of harmony and coöperation.

Another feature of the convention was the presence of representatives of various state commissions and officials whose work touches the regulation or operation of the electric utilities. Participation in the discussion by President Edgerton of the California Railroad Commission introduced a new element in the far coast convention. His message was a warning of the prospect that utilities will be owned by the public unless new ideals are established. This warning found, as it is right that it should find, a ready and responsive audience. We believe that the disposition and purpose of the industry are to keep their service better in quality and cheaper in price than any corresponding service can be given by public authorities under the conditions of political life in America to-day. The ideal of service is indeed being made paramount. It is a notable indication of the thought of the times that the leaders of the industry on the Coast pledge President Edgerton their best effort to establish and maintain a fixed and a steadfast policy of service before profit.



Seventy-fourth Street Station of Interborough Rapid Transit Company, Showing Four Turbo-generators Rated at 150,000 Kw.

In the foreground is shown a 60,000-kw., three-cylinder, cross-compound, 25-cycle turbo-generator completed on Oct. 9, 1918, by the installation of the second low-pressure element.

One of the low-pressure elements was placed in service April 18, 1918, and operated on high-pressure steam. The high-pressure element was cut into service on Aug. 21, 1918, and operated in connection with the low-pressure element already in service. The three units shown in the background are of the same size and design, each being a two-cylinder, cross-compound, reaction turbine element with the generators rated at 30,000 kw. The first unit was placed in operation on Dec. 30, 1914, the second in February, 1915, and the third in August, 1915. The new unit is now usually in continuous service for six days per week.

Three-Cylinder, 60,000-Kw. Turbine Installation

Operating Details of the Largest Turbo-Generator Yet Built and the First Three-Cylinder Unit in America—Automatic Control Enables Any Two Elements to Do the Work of Three in Case of Trouble

BY W. S. FINLAY, JR.
Superintendent Motive Power, Interborough Rapid Transit Company, New York City

ON OCT. 9, 1918, there was placed in service at the Seventy-fourth Street station of the Interborough Rapid Transit Company, New York City, the third element of a Westinghouse 60,000-kw., three-cylinder, cross-compound, 25-cycle turbo-generator. This is the fourth cross-compound unit installed by this company since the latter part of 1914. The three units installed first were of the Westinghouse two-cylinder, cross-compound, reactance design, rated at 30,000 kw. maximum each, having a point of highest efficiency at 25,000 kw. when operating at 205 lb. steam pressure (14.35 kg. per sq.cm.), 150 deg. Fahr (83 deg. C.) superheat and 29-in. (736 mm.) vacuum.

The new unit, besides being the first three-cylinder turbine to be placed in operation, is the largest yet designed. Its maximum continuous rating is 60,000 kw.

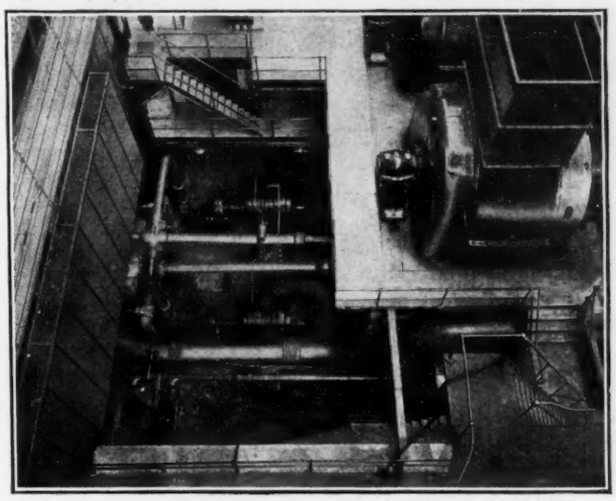


FIG. 1—VIEW OF PUMP ROOM DIRECTLY UNDER THE 60,000-KW. TURBO-GENERATOR, LOOKING DOWN FROM A CRANE; SHOWING ACCESSIBILITY OF AUXILIARY APPARATUS

and 70,000 kw. for two hours. It occupies a floor space of 52 ft. by 50 ft. (7.6 m. by 15.2 m.), and its maximum load requires 826,000 lb. (375,000 kg.) of steam per hour. This unit is designed to operate with steam at 205 lb. per square inch (14.35 kg. per sq.cm.) gage pressure, superheated 150 deg. Fahr (83 deg. C.) and to exhaust at a temperature of 540 deg. Fahr. (282 deg. C.) at a vacuum of 29 in. (736 mm.) of mercury. At the load of 40,000 kw., which is the point of best economy of this unit, the high-pressure element will receive its steam at a pressure of 211 lb. per square inch (14.7 kg. per sq.cm.) absolute and a temperature of 538 deg. Fahr. (262.9 deg. C.). It will exhaust into the low-pressure elements at a pressure of 29.7 lb. per square inch (2.07 kg. per sq.cm.) absolute and a temperature of 250 deg. Fahr. (121.1 deg. C.), in which elements it is further expanded down to the pressure in the condenser, which is one inch of mercury absolute and a temperature of 79 deg. Fahr. (26.1 deg. C.).

Like the original two-cylinder machines, the new unit is built on the cross-compound principle and consists of one high-pressure turbine and two low-pressure turbines, each being coupled direct to its generator and all three elements when in normal operation tied together electrically. The steam path is such that all the steam passes through the high-pressure element, then divides equally and flows through the two low-pressure elements. This principle of design, by dividing the work done into separate cylinders, allows smaller individual elements which are inherently stronger than large cylinders; it makes possible an outlet considerably more flexible than a single large unit, and more reliable, because the turbines are smaller and there is less temperature difference in any one cylinder; and commercially common materials with moderate speeds and stresses can be used.

Each turbine runs at a speed of 1500 r.p.m. and is connected to a generator of 20,000 kw. continuous rating and 23,500 kw. for two hours, which delivers three-phase, 25-cycle energy at 11,000 volts.

CONNECTIONS FOR THE THREE 20,000-KW. GENERATORS

From an electrical point of view the connections of the new 60,000-kw. unit were adapted to the general scheme used with the 30,000-kw. units already in operation. Each generator has a separate oil switch connecting it to a short generator bus. From this bus the current can be led to each of two main bus sections through oil switches or to the transfer bus through another oil switch. It is possible by this form of construction to operate each element separately or in any combination desired. In practice, however, the three generator switches are closed and the whole unit is brought up to speed as one, the snychronizing being done through one of the oil switches leading to the main bus sections or transfer bus. The proper disconnecting switches were placed in series with the oil switches, some of them being remotely controlled. Suitable current transformers and potential transformers with their proper instruments were installed so as to measure the output of each generator separately, there being in addition a large totalizing transformer by which the combined loads of the unit can be metered on one instrument.

Reactance coils of 5 per cent value were inserted between the generator bus and the two sections of the main bus, and another of 2 per cent value between the generator bus and the transfer bus. The percentage values are 5 per cent and 2 per cent of the star voltage when carrying one-half load. Each generator is protected by a relay system devised by the late H. G. Stott, which is a modification of the Merz-Price system. Should a burn-out occur in the windings of any generator, the unbalanced currents will operate a relay which in turn will open the oil switch, disconnecting the generator from the line.

The reactance coils permit only a limited amount of

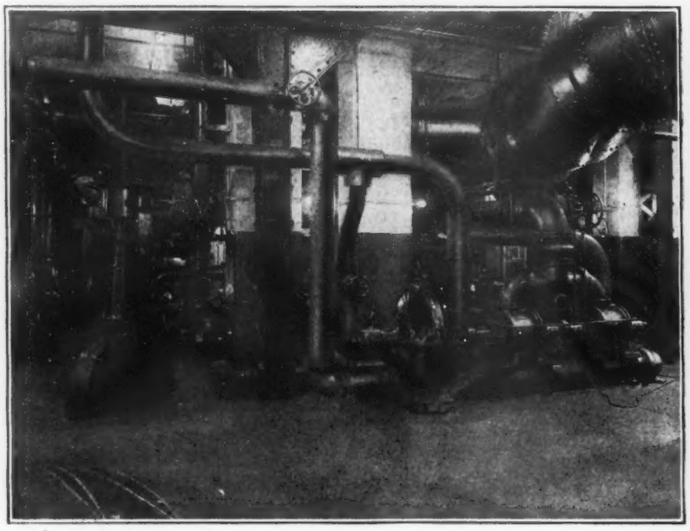
current to flow between the generators. Any tendency for an abnormal flow in current causes a circuit breaker to open the circuit. This is done for the purpose of insuring the continuous operation of the remaining elements should a short circuit develop in the feeder system of any one of the three elements.

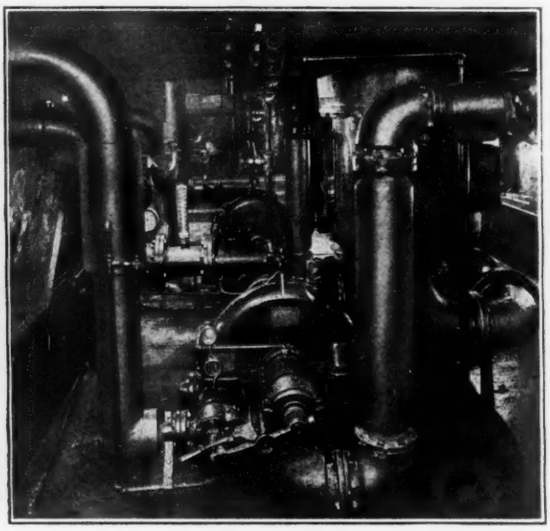
Although this 60,000-kw. unit consists of three separate elements, the method of starting the elements from rest preparatory to synchronizing is essentially the same as for single-shaft units. First, the field current of all three generators is applied, then the throttle valve on the high-pressure element is partially opened. As soon as the high-pressure rotor starts revolving it will, through the applied field current, start the rotors of the two low-pressure elements revolving. This causes all three elements to come up to speed together and in correct phase with each other, so that when synchronizing with the system they can be connected to the main busbars by closing a single circuit breaker.

By the use of an ingenious governing arrangement means have been provided that will permit uninterrupted operation of each individual element, should one or the other two elements be taken out of service by tripping the automatic stop from any cause not affecting all three elements. For example, if the high-pressure element be shut down, each low-pressure element will automatically receive high-pressure steam direct from the boilers through its own individual high-pressure steam system, whereas in normal operation the low-pressure elements do not receive any high-pressure steam direct. Vice versa, if the two low-pressure elements be shut down from any cause not affecting the high-pressure element, the high-pressure element will continue operating and automatically exhaust its steam into the atmosphere, but should only one low-pressure element be removed from service, the high-pressure element will exhaust into the remaining low-pressure element. All this governing arrangement, as before stated, is entirely automatic. Such flexibility, needless to state, is not possible with turbines employing a single generator unless they be of as small capacity as one of the elements.

Since the governing mechanism must control three units, not only when operating together but when operating separately, it involves several features novel in steam-turbine practice. Each unit is provided with an overspeed stop governor which will immediately shut off the steam from that unit if the speed rises above a predetermined amount. Each unit is also equipped with a speed-regulating governor, of which that on the high-pressure unit is of the customary form. The speed-regulating governors on the low-pressure units are somewhat more complicated.

A butterfly valve capable of automatic operation is provided in each connection between the high-pressure and low-pressure units, which will be automatically closed should the low-pressure turbine speed exceed the predetermined limit. This is tripped shut first by the speed-regulating governor, should it go to the outer position, and, in event of its failing, then by the automatic stop governor. The high-pressure turbine is provided with another exhaust having a back-pressure valve, so that when necessary the exhaust from the high-pressure turbine may pass to atmosphere and the high-pressure turbine continue to carry its load.





FIGS. 2 AND 3—VACUUM AIR PUMPS AND CONTROL VALVES ARE SHOWN AT THE LEFT AND THE HOT-WELL PUMPS FOR THE UNIT AT THE RIGHT

Similarly, should the high-pressure element lose its load, its governor will cut off steam to the whole system. If the governor does not control the turbines and its speed reaches the predetermined limit, then the stop governor on the high-pressure element will close the automatic throttle, similarly cutting off steam from the whole system. The whole system will then slow down until it reaches a predetermined speed lower than normal, when the governors on the low-pressure turbines will cause live steam to be admitted directly to them.

The high-pressure turbine governor is adjusted for close regulation, say 3 per cent for its total range. It is necessary, of course, that the system operate from no load to full load—that is, be subjected to the speed variation in this 3 per cent range—without the low-pressure governors performing any of their functions, admitting live steam to the low-pressure turbines, on the one hand, or closing the connection between the high and low, on the other. Hence the travel of the low-pressure governors may be said to be divided into three zones—the outer position of the governor weights operating the butterfly valves and admitting steam to the low-pressure element—the inner position of the

weights controlling and regulating the admission of high-pressure steam to the low-pressure turbines. Between the outer and inner position is a portion of the governor travel which is called "neutral," and when the governor is within this portion of its travel it has no effect on any of the control apparatus.

There is a butterfly valve in the low-pressure line which is controlled from the governor of the corresponding low-pressure turbine. Each valve is operated by a differential piston, to both sides of which steam pressure is admitted. One end of this cylinder is connected to a valve-trip mechanism at the low-pressure governor and so arranged that when the governor reaches a prescribed position a valve will be tripped open, thus releasing steam from that side of the differential position. Steam pressure in the other side will then quickly force the butterfly valve closed. If the turbine is to be shut

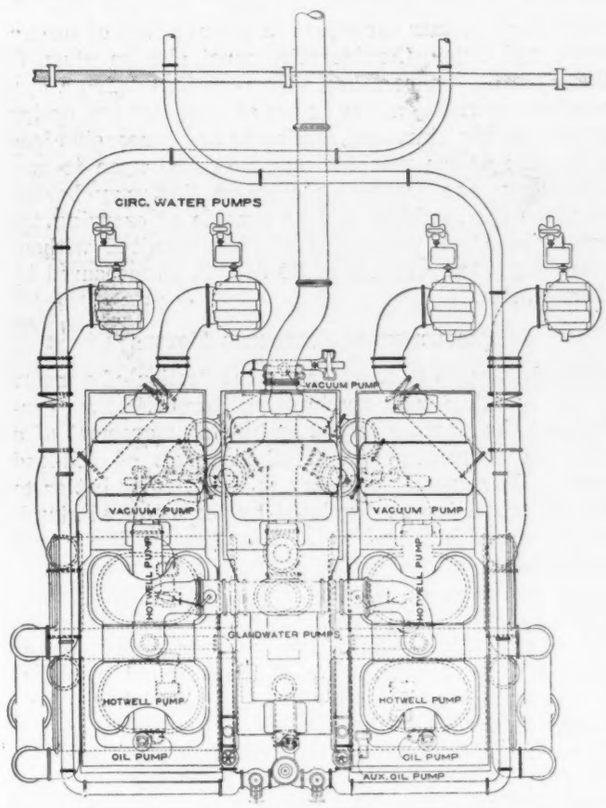


FIG. 4—LAYOUT OF THE 60,000-KW. TURBO-GENERATOR ELEMENTS AND ARRANGEMENT OF STEAM LINES, ATMOSPHERIC EXHAUST AND CIRCULATING WATER PIPING UNDER UNIT

down, the gate valve is then closed by hand. The butterfly valve may be opened or closed also by a hand-controlled valve. The valve controlling live steam direct to the low-pressure turbine will begin to open when the low-pressure governor reaches a prescribed position. This valve mechanism does not differ in principle from the main high-pressure valve controlling steam in the system and is in conformity with ordinary practice.

The overspeed stop governor on the high-pressure turbine will close the main throttle valve and the main regulating valve, while that on the low-pressure turbine will bring about the closing of the butterfly valve and the governor and throttle valves admitting high-pressure steam to the low-pressure turbines.

As part of the throttle valves there is a switch which when closed will open the main circuit breaker. Should some accident happen to one of the turbine elements, it may be instantly cut out by operating the emergency stop, which will cause the immediate closing of the automatic throttle. This in turn causes the closing of the switch, which opens the circuit breaker.

The operation of this apparatus may be further described by the following examples:

1. If on account of some electrical trouble the circuit breaker opens between the generator of a low-pressure turbine and the bus, this turbine will then be relieved of load and will speed up 3 per cent (provided that the governor has been maintained in the central position). Before it has speeded up 4 per cent the low-pressure butterfly valve will have dosed. In the meantime the steam is still going into the high-pressure turbine. The exhaust pressure of the high-pressure element will then rise, if the load be great enough, until the back-pressure valve on the exhaust opens, permitting the high-pressure turbine to continue operating, a fraction of its steam exhausting into the atmosphere, the remainder passing to the low-pressure turbine which is in operation.

Upon closing the butterfly valve, the low-pressure turbine, receiving no steam, will commence to slow down, and when it has reached 3 per cent below normal the governor valve admitting high-pressure steam to the low-pressure element will commence to open, and unless some adjustment is made, it will remain at that speed under the control of its governor.

2. If an accident happens to a low-pressure turbine making it desirable to take it out of service quickly, the operator can trip the emergency stop as he would on any turbine, which will cause the closing of the butterfly valve, then admitting low-pressure steam, and the throttle valve, which later would admit live steam to the low-pressure. The throttle valve, being automatically closed by the emergency stop, will close the switch, which will open the circuit breaker, when the low-pressure turbine will come to rest.

3. On a disturbance to the electrical system which will cause the opening of the circuit breaker on the generator of the high-pressure turbine, the high-pressure turbine, being relieved of load, will speed up an amount corresponding to the regulating characteristics of the high-pressure governor, cutting off nearly all the steam supply to the whole system, only enough steam passing through the high-pressure element to maintain it at speed.

If there are enough units operating on the system to take the load that has been dropped by this unit, the low-pressure turbines will continue in service but carry practically no load. If, however, there are not enough units in the system to carry the load, then the frequency of the whole system will fall 3 per cent (provided that the low-pressure governor has been maintained in its central position), when high-pressure steam will begin to be admitted direct to the low-pressure turbine and a further fall of 3 per cent will give complete opening to this governor valve, admitting high-pressure steam.

Should it then be found that the exigencies of the system demand that the low-pressure turbine continue carrying the load, the switchboard operator may by his distant control of the governor tighten the governor spring by means of the motor until he brings the speed of the unit (and system) to normal, when the low-pressure turbines may continue operating indefinitely, carrying any load within their capacity with the governor regulating the high-pressure valve opening.

4. In case of an accident to the high-pressure turbine its emergency stop may be tripped, which will bring about the automatic closing of the main throttle valve. This valve, when automatically closed, will close the switch that is on the throttle valve, which in turn will open the main circuit breaker on the high-pressure turbine, after which the operation will be the same as in case 3.

Since each low-pressure turbine has its independent governor, it is obvious that either or both will operate indefinitely if the high-pressure turbine has been put out of service as indicated in either 3 or 4 above.

If the throttle valve be manipulated by hand in the usual way, it will have no effect on the switch that is on the throttle valve. This switch will only be closed when the throttle valves are operated by the emergency stop.

The Continuous-Rated Motor and Its Application

Reasons for Adopting 50-Deg. Temperature Rise for Motor Rating—Development of Motor Design and Amelioration of Hot Spots Make It Possible to Get the Maximum Out of Motor Material

BY L. F. ADAMS
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THE industrial world has come to realize the benefits of standardization, and during the first part of this century manufacturers began to place their production on a quantity basis, thus lowering overhead charges, reducing stocks, simplifying factory methods, tending toward interchangeability of working parts and, most important, giving better service to the purchaser. The individualistic method of standardization, however, resulted in each manufacturer working out his own standards without due regard to those of others, and naturally the outcome was as many standards as there were manufacturers.

These methods, coupled with the keen competition of recent years, created a general desire on the part of all for a common standard. The individualistic method of standardization gave way to collective effort. In the electrical field this latter idea is embodied in the Standardization Rules* of the American Institute of Electrical Engineers.

The Institute rules make certain definite recommendations covering electric machinery and apparatus. The following discussion will be confined to an interpretation of these standards as applied to motors and to motor applications.

Motor Design Becomes More Exact

During the past few years many important improvements have been introduced in motor construction, such as the addition of commutating poles in direct-current machines to improve commutation, better methods of insulating the windings to resist puncture, elimination of excessive hot spots by the use of internal directive ventilation, etc. These improvements have assured a uniformity of product which formerly would not have been considered within practical limits.

Similar advances have been achieved in the application of motors and the use of the control best suited for any particular purpose. In the pioneer days motors were usually substituted for other forms of power with but one thought in mind—to have the motor large enough. The vast amount of data now available as to the power requirements of various machines, the large number of well-trained men now engaged in the application of motors and the unusual desire to do things better to-day than yesterday mean that motors must now be selected and applied with a greater degree of accuracy than was considered essential in the early days.

It is better to have a motor underloaded than so heavily loaded that it cannot operate successfully. On the other hand, there is no real advantage in selecting a size and type of motor which is unduly large or expensive for the work. The selection of an unduly large motor means a larger outlay in first cost and a higher yearly charge for power because of the lower average operating efficiency. In the case of alternating-current motors over-motoring lowers the power factor, requires a more expensive transmission line and larger generators, and causes poor regulation and greater line losses. Finally, the unused capacity of the motor is without resulting benefit to any one.

What are the requirements for a successful operating motor? A motor produces torque and speed, the two elements required to drive any load. The load requirements have certain variations in the relations of torque, speed and time. Consideration must also be given to the operating temperature. We therefore define a successfully operating motor as one of such size and design as will readily start and accelerate any reasonable load which the driven machine may be called upon to sustain, carry any reasonable overload that may be imposed on the machine, and be capable of carrying the normal load for the period of time required without exceeding a temperature of 90 deg. C. as measured by thermometer.

Procedure in Selecting Motors

The first point to consider in the selection of a motor is the starting and accelerating torque. For convenience the starting torque or turning movement of a motor is frequently spoken of in terms of full-load torque. For greater accuracy it is obviously better to use the actual torque developed by the motor at standstill expressed in pound-feet. After the starting torque requirements of the driven machine have been determined the ratio of starting torque to normal torque should be noted. The ratio, if relatively large, indicates that a compound-wound or series-wound direct-current motor will be preferable to a shunt-wound machine, or that a slip-ring or high-resistance rotor alternating-current motor should be selected in preference to the standard squirrel-cage motor. Substantially the same method may be used for services requiring very frequent starting. Careful consideration of the starting and accelerating torques frequently permits the selection of a motor of smaller horsepower rating than would otherwise be employed.

The next question is one of peak load. This is usually expressed as a percentage of full-load torque. Here, too, it is better to express this torque in pounds at one-foot radius as this expression eliminates the full-load speed, which is a variable. Ample margin must be allowed between the requirements of the driven machine and the maximum torque developed by the motor. The maximum running torque which the motor will deliver without undue drop in speed is usually of greater importance than the maximum horsepower output, because in many applications a slight drop in speed on the peaks is advantageous, for the inertia or flywheel effect in the driven machines assists in carrying the load over that peak.

Another point of interest in the selection of a motor is the horsepower rating. This will be largely a measure of the motor's ability to do the required work for

*Latest edition, revised 1918.

the specified period without exceeding the safe heating limits or violating other requirements of successful operation, such as good commutation.

DISCUSSION OF LIMITING TEMPERATURE

Heating in motors is primarily of interest only as it affects the life of insulation. The heating standard must be in the form of a limiting temperature, this limit to be sufficiently low to insure that insulation continuously subjected thereto will not deteriorate in so far as its insulating qualities are concerned. Evidently the logical upper limit should be based on the ultimate temperature at which the motor is to be operated, since it is above this that the insulation begins to weaken. After careful investigation, supported by tests and in the light of practical experience, the American Institute of Electrical Engineers has set a temperature 5 deg. C. above that of boiling water, *i.e.*, 105 deg. C—as a conservative and safe limit for the temperature at which treated fibrous insulation can be used without deterioration. The question arises: Would insulation last longer at a lower temperature? Experience indicates a negative answer. This is to be expected, because even the highest permitted temperature is well below the danger zone. The American Institute of Electrical Engineers in its Standardization Rules, Section 302, states:

"There does not appear to be any advantage in operating at lower temperatures than the safe limits, so far as the life of the insulation is concerned. Insulation may break down from various causes, and when these breakdowns occur it is not usually due to the temperature at which the insulation has been operated, provided the safe limits have not been exceeded."

Having established a suitable upper limit, the next step was the selection of a conservative standard for the cooling medium, or surrounding air temperature, or, as it is called in the Institute rules, the "ambient temperature." The value settled upon by the Institute is 40 deg. C. In a building this represents an extraordinarily hot day or a very highly heated room for ordinary industrial purposes. It is a temperature approached in all parts of the temperate zone at some time during the year. It is improbable that the average standard motor will normally be required to operate in temperatures as high as 40 deg. C. for any considerable period of time. For all except the hot days of summer 21 deg. C. very closely represents the average mean room temperature. Therefore, under normal conditions, motors will seldom operate under so high an ambient temperature as has been proposed, and the value selected is consequently very conservative. Incidentally, in the international conferences on standardization previous to 1914, practically all other electrical societies agreed in recommending 40 deg. C. as the ambient temperature, but two countries of northern Europe held out for the less conservative ambient temperature of 35 deg. C.

From what has preceded it is evident that the motor manufacturer in following the Institute standards can design his motor for any temperature rise which, based on an ambient temperature of 40 deg. C., will not exceed 105 deg. C., *i.e.*, 65 deg. rise. It should be borne in mind, however, that the temperatures so far used are the external or observable temperatures of the motor and no allowance has been made for the greater heating of the interior and inaccessible parts. It is very difficult to measure internal temperature by ordinary thermometers, and thus the ultimate temperature of motors, or the actual temperature rise, is arrived at by assuming that the hottest spot in any part of a well-designed motor will have a temperature not more than a certain definite number of degrees above that of the observable temperature of the same part. The Institute's allowance for the difference is 15 deg. C. for open-type motors. This would apply to thermometer readings for ultimate as well as for temperature rises. In other words, the ultimate observable temperature is 90 deg. C. for treated fibrous materials, or a temperature rise of 50 deg. C. above ambient temperature. On totally inclosed motors there is less difference between the hottest spot and the observable temperature, so that 10 deg. C. is a fair allowance for inclosed motors. Therefore the observable temperature rise permitted for open motors is 50 deg. C., and for totally inclosed motors 55 deg. C. While in some designs the permissible temperature rise is decidedly the limiting feature, in other designs the requirements of other conditions will result in a lower temperature rise.

INSULATION SAFE AT 50-DEG. RISE

It might appear that a motor which has a temperature rise of 40 deg. C. will have a longer life than one designed for 50 deg. C. As previously pointed out, this is not true, because the limit adopted by the Institute for the ultimate temperature is well below that point at which deterioration of the insulation will take place. The situation in this case is roughly analogous to the amount of heat required to produce steam. If the quantity of heat is such that the temperature of water never exceeds 90 deg. C. no matter how long it is applied, no steam will result because the water has not reached the boiling point. In a like manner deterioration in insulation will not occur until its critical point, analogous to the 100 deg. C. for boiling water, is reached.

In case the ambient temperature is under 40 deg. C.—say 20 deg.—it might seem that the motor could be operated at a greater temperature rise. This is possible in some cases, but a very dangerous policy, and the Institute's rules do not sanction such loads as shall occasion in the insulation a temperature rise in excess of 50 deg. C. This is a matter of such importance as to justify reproducing from the Institute rules the text of section 305A, which follows:

"Whatever may be the ambient temperature when the machine is in service, the limits of the maximum observable temperature or of temperature rise specified in the rules should not be exceeded in service; for, if the maximum temperature be exceeded, the insulation may be endangered, and if the rise be exceeded, the excess load may lead to injury by exceeding limits other than those of temperature, such as commutation, stalling load and mechanical strength. For similar reasons, loads in excess of the rating should not be taken from a machine.

With reference to horsepower rating, the Institute has adopted two distinct ratings—one a continuous rating,* the other a short-time rating. The meaning of the first is self-evident. The second will be reviewed. It is, briefly, the equivalent output which a motor can deliver for a specified time, such as during 5, 10, 15, 30, 60 or 120 minutes without exceeding a temperature rise

*Throughout the remainder of this article, "continuous rating" will mean a motor that will operate continuously without exceeding a temperature rise of 50 deg. C.

of 50 deg. C., provided that after each run and before starting on the next run the motor be allowed to cool to within 5 deg. of the ambient temperature. It is also understood that the motor must operate without violating the requirements of successful operation, such as commutation, sufficient starting and maximum torque, suitable mechanical strength, etc. The short-time rating is primarily a method of expressing a thermal equivalent. For example, motors built to operate valves frequently receive a five-minute short-time horsepower rating because the operations are normally intermittent and the principal requirements are with reference to mechanical strength, torque and commutation. Crane motors are similarly rated on an equivalent thirty-minute basis—since crane motors are operated for longer periods of time than valve motors, although somewhat similar torque characteristics are required. Machine tools, compressors, etc., are frequently rated on a 60-minute or 120-minute basis, as the period of operation and the duty cycle of the load are such as to make this a close heating equivalent. A machine tool, for example, might be operated for a longer period than specified, but the periods of heavy load and light load must be such that the ultimate heating of the motor will be closely equivalent to the rated horsepower for the time stated.

LIMITATIONS OTHER THAN TEMPERATURE RISE

It sometimes happens that some certain requirements may prove a limiting factor in rating a motor, with the result that all the other factors have an unnecessary margin between these values and those recognized as safe standards. Where heating is the limiting factor in the rating or selection of a motor, the horsepower rating may be said to represent simply the equivalent load which produces the same heating as would accrue under full normal load in continuous operation. Under these conditions, a 10-hp. motor will develop 10 hp. for the period of time specified without exceeding the predetermined safe heating limits, or it will carry a varying load which will result in the same or lower ultimate temperature for the period in question. As an example consider a 10-hp. continuous-rated motor. Suppose a duty cycle of 9.5 hp. 90 per cent of the time is to be imposed on this motor, the other 10 per cent to consist of momentary loads of 13 hp. and underloads of 3 hp. to 7 hp. The heating effect on the motor due to this duty cycle would be about the same as if 10 hp. were delivered continuously. It should be borne in mind, however, that the variations of current, rather than the actual variations of mechanical load, must be used in determining the heating equivalent. It should also be noted that while a 10-hp. continuous-rated motor would meet the heating limitations, it would not be satisfactory unless the starting and maximum running torque available were ample to meet the starting and running overloads imposed on the motor, and that successful commutation should not be exceeded.

The capacity and rating of the machine, although frequently used interchangeably, are not synonymous terms, according to the Institute. The capacity of the machine is the maximum output which it can successfully deliver for a stated period. The rating of the machine is the output stamped on the name plate. The maximum limit for this rating is the capacity of the machine. There is no minimum limit.

The purchaser is usually interested in knowing all the facts about the possibilities of the machine that he is buying; *i.e.*, the capacity of the machine consistent with the requirements of starting torque, maximum running torque and similar factors. This logically means that the name-plate rating stated in the accepted even ratings should closely correspond with the capacity rating. Such a rating has been referred to as a continuous or 50-deg. rating. Possibly the term " capacity rating," within the limits above specified, is the most descriptive.

It is obvious that the system which has been widely followed in the past, of giving a normal continuous rating with 25 per cent overload for two hours, is not a capacity but a fractional rating, and that it represents but one form of duty cycle. Under this method of rating, a 10-hp. motor will carry 10 hp. continuously with a temperature rise of 40 deg. C., and at any time during such operation will carry 12½ hp. for two hours with a temperature rise of 55 deg. The temperature rise in these few hours is only a few degrees less than the ultimate temperature which will be attained in eight or ten hours. Consequently, the capacity of such a machine (provided that the rating does not understate or overstate the possibility of the machine) would be about 11⅜ hp. continuously, or a short-time rating for thirty minutes of approximately 15 hp. This example illustrates that a continuous-rated or capacity-rated motor is classed conservatively with reference to heating since the temperature rise for such an open motor is limited to 50 deg. C., whereas the temperature rise on a 25 per cent overloaded motor is 5 degrees higher, *i.e.*, 55 deg. C.

It must not be overlooked, however, that the intent of the Institute rules is not to require a 50-deg. rise but to fix it as a limit for good engineering practice. Designing engineers have long recognized that a temperature rise of 35 deg. in itself is absurdly low, but the object in operating at such low temperature, measured on a part of the motor accessible for the application of a thermometer, was simply to protect the motor in the hot spots where the temperature could not be measured. It became the fashion to call for motors of 35-deg. rise, and no doubt the users never knew the real meaning of such low temperatures. Improvements in insulating material, more modern methods of preparing and applying the insulation, together with the knowledge of hot spots gained from tests and experience, have contributed to the Institute's recognizing 50 deg. as being the safe upper limit. The rules do not, however, require the motors to be so designed as actually to have this temperature rise. Without doubt, designing engineers will retain a safe margin below 50-deg. rise in the continuous-rated motors.

MOTORS COMMONLY TOO LARGE

Other factors will also enter to increase this margin of safety. Usually the ambient temperature will be below 40 deg. C., thereby insuring additional safety. Many motors are running to-day shamefully underloaded, and it is to be expected that numerous applications in the future may be at less than the rated load of the motor, although it is hoped that the universal disposition to underload will be overcome to a great extent in applying continuous-rated motors. Analyses made by various power companies have indicated that motors are from 20 to 25 per cent larger than necessary, causing the installation of excess transformer capacity and running

up investment costs. Numerous motors are driving a number of machines each having its own duty cycle (such as a machine shop), and investigations have shown that in most applications of group drive, as well as in some cases of individual drive, the demand factor is less than 100 per cent. Evidently such operation will also increase the margin of safety.

Compare the factor of safety of a motor rated in the old way with that of a motor rated in the new. Was the purchaser any better off? No; because the intended margin was not sufficiently definite. A motor of a certain rating with a certain overload guarantee gives much less idea what can be obtained from the machine than a motor rated on the continuous basis. By the old method a motor was capable of carrying 25 per cent overload. If the load is steady and there is no overload, 25 per cent of the possible output of the motor is wasted and the motor is larger than necessary. If it happens that the average load, equal to the rated load, fluctuates up or down 10 per cent, there still remains an unnecessary margin of 15 per cent. If the load varies 50 or 100 per cent, the margin of 25 per cent is worthless and the motor would in all probability burn out. To drive a load requires a certain maximum horsepower output. Under the old method of determining the size of a motor it was customary to deduct 25 per cent from the maximum output required by the machine the motor was to drive and thus arrive at the normal rating of the motor. The new method of rating simplifies the determination by omitting the 25 per cent overload, which is not really overload, and merely stating that the maximum load is so much and therefore the motor is rated at that load.

This new and simplified method of rating places on the purchaser the burden of determining the appropriate margin to be provided. The industry is far enough advanced for the users to be capable of selecting their own margin. The application engineers of to-day are fully conversant with the diversified requirements of the industry, so that they will have no difficulty in selecting the proper motor for each specific case. There is no excuse for guessing at the duty a motor must fulfill. Twenty years of education should have taught the user how to make allowance for the conditions he has to meet. The new method of rating assists both the seller and the buyer by defining more completely the capability of the motor.

Some confusion exists due to the impression that continuous-rated motors will not stand any overload. The motors are guaranteed to stand 50 per cent momentary overload, but they are not guaranteed for any overloads which in heating effect are equivalent to more than their rated output; *i.e.*, that will cause the motor to exceed a 50-deg. C. rise at any time. In case a motor is subjected to peak loads in excess of the ordinary load and the peak endures for more than a short time, it must be included in the rating. If, however, the peak load lasts for brief periods only, the rating must be sufficiently above the ordinary load to give a continuous thermal equivalent to that required on the brief peak loads without exceeding the permissible temperature limits. From the explanation of the short-time rating it is obvious that the machine will actually carry overloads within the maximum torque capacity of the machine, but the heating equivalent must be within the limits specified or the motor will not be used within the conditions specified in the guarantees.

It is common practice to rate generators on a continuous basis. During the last ten years such generators, particularly those for connection to steam or water turbines or gas engines, have been purchased very generally on the basis of a 50-deg. C. rise. The tendency is to rate the machine at the highest point it can be operated at safely in continuous service, thus getting the maximum output possible from the investment. In case a margin for overload is desired, it is necessary to increase the rating of the machine so that the name-plate rating equals the maximum load desired. However, transactions arise where it is necessary to rate the generators on a 40-deg. C. basis, and in these instances the rating is taken as 83⅓ per cent of the rating as a continuous-rated machine.

Question of Name-Plate Marking

In this same manner it will be possible to tell the capabilities of a continuous-rated motor operating on a 40-deg. C. basis. For example, a 10-hp. continuous-rated motor will without change operate as successfully as a 8.33-hp., 40-deg. C. motor and as such will be capable of sustaining an overload up to 10 hp. with 50-deg. C. rise. This is a scientifically correct method, and the only equitable one for obtaining a 40-deg. C. rating from a continuous-rated motor. The objection is that when applied to the continuous-rated motor in standard ratings it gives odd ratings instead of the even ratings to which we are accustomed. However, it is not necessary to place the odd rating on the name plate. All motors sold to-day have a name-plate showing, among other factors, the horsepower and corresponding temperature rise. Therefore, mark all name plates with the continuous rating, and let it be universally understood that the 40-deg. C. rating is 83⅓ per cent of the name-plate rating of a continuous-rated motor.

Another method of obtaining the 40-deg. C. rating from the continuous-rated motor is to "derate" to the next even rating. This means that a 10-hp. continuous-rated motor becomes a 7½-hp., 40-deg. C. motor. Following this method through the line of even ratings gives ratios of 66, 75, 80 or 83 per cent. It is quite evident that this is not the right method of procedure, as at a 40-deg. C. rating the motor contains more material than is necessary to justify the designated rating. Such a system of rating is entirely wrong as it is a direct blow at the conservation of material—recently a very important matter.

Getting the Most Out of Motor Material

Under the continuous-rating system the purchaser will know exactly what he is getting and pay for that only. Just a little thought will enable the purchaser, his engineers, or the application engineer, to select the proper size and type of motor. In the transition period, however, it should be realized when applying these motors that it is particularly unwise to assume that because a 10-hp. motor with 25 per cent overload for two hours did the work, a motor of the same continuous capacity will do the same work. It may or may not do so, depending entirely upon the starting and maximum load requirements and the heating equivalent of the cycle of duty; but it should be fully realized that the motor will carry its rated load continuously with as great a factor of safety as will a motor guaranteed to carry 25 per cent overload for two hours, and it will have equally long life and be equally reliable.

Electric Service in World's Largest Hotel—I

All Necessities, Conveniences and Comforts So Depend on Electricity that Reliability of Service Was All-Important—How It Was Obtained Economically—Features of the Electrical Equipment of Hotel

HOTEL PENNSYLVANIA, the largest hotel in the world, which was recently opened in New York City with accommodations for 3500 registered guests, is not only interesting because of its magnitude and excellent appointments but because of the many conveniences which have been made possible by electricity. Besides, the electrical equipment—including lighting, electric cooking, signaling and communicating apparatus, motor-driven applications and provisions for using electric service—represents the latest word in the hotel world. While in the hotel appointments too great plainness has been avoided, little can be seen of an extremely ornate kind or suggestive of lavish expense, so that many of the practices, arrangements and electrical applications can be copied to good advantage in hotels of a smaller sort both physically and financially. The conditions which made it practicable to supply electric service in the manner adopted are not, of course, duplicated everywhere, but nevertheless the factors taken into account are well worth the consideration of all engineers.

From an illumination point of view, the lobby, ballroom and dining room are particularly attractive, while the lighting of the guest rooms, corridors and service rooms is economical yet ornamental enough for other hotels to follow. The elevator service has been very effectively worked out, there being twenty-seven electric elevators, including an automobile lift, dumbwaiters and freight hoists. In the kitchens are electric warming ovens, ranges and motor-driven kitchen appliances. Being really a small city in itself, the hotel has been equipped to be independent of most outside agencies such as hospitals, restaurants, barber shops, machine, carpenter and other shops and laundries, and almost every known application of electricity can be found somewhere in the hotel. The laundry is the largest electrically driven one in the world. Electric signaling and communication have been extensively applied, there being 260 trunk telephone lines, 3340 extensions and 23 operators in the hotel, besides 200 telautographs, an electric clock and time-stamp system and a fire and watchman signaling system. Some idea of the magnitude of the electrical equipment may be gained from the fact that there are more than 2,000,000 ft. (600,000 m.) of No. 14 to 2,000,000-circ.mil conductor installed, besides 635,000 ft. (195,000 m.) of ½-in. to 4-in. (1.25-cm. to 10-cm.) conduit, 240 distribution panels, controlling about 2250 kw. in lighting, to say nothing of the thousands of sockets and receptacles, switches and lighting fixtures.

Since service is the outstanding requirement of a hotel, one of the fundamental conditions laid down by the consulting engineer for the hotel was that a failure of the electric service must be practically impossible, and this end was attained by providing two independent sources of supply; namely, from the main power station of the Pennsylvania Railroad at Long Island City and from a generator in the hotel operated by steam purchased from the Pennsylvania Terminal. The first source can take care of all the requirements of the hotel, while the generator is able to provide enough energy for emergency lighting and power purposes.

Before these sources of supply were decided on, however, other methods were carefully considered, among them being a private and independent isolated plant in the building and central-station service with heating service from an isolated plant near by. The problem of securing steam* for heating and other purposes was necessarily as important as obtaining electric service, and therefore the two were considered jointly.

The New York Edison Company was handicapped in giving the service desired by the difficulty of providing the steam. A heating plant in the hotel was not desirable because it would involve handling coal and ashes around the hotel—one of the chief things that were to be avoided by central-station service.

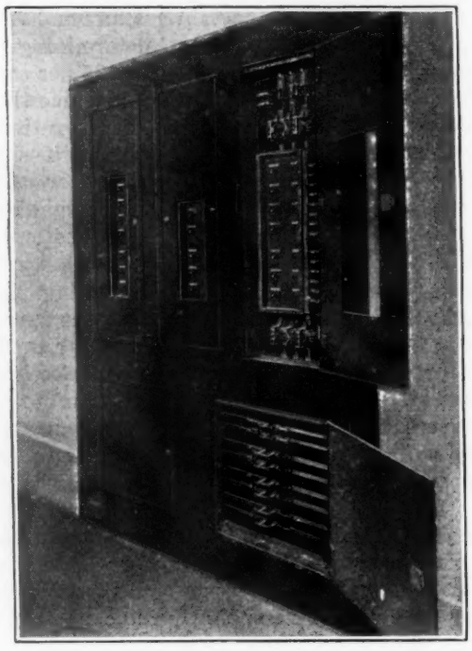


FIG. 1—DEAD-FRONT PANELBOARD WITH LIVE PARTS ACCESSIBLE ONLY TO AUTHORIZED PERSONS

The choice, therefore, lay between a private plant and the purchase of steam and electricity from the Pennsylvania Railroad. As the railroad company is the owner of the property, it was naturally anxious to give the hotel operating company as favorable a rate as possible. For this reason, and because it was not desirable to handle coal and ashes or to use valuable space in the hotel for boilers, it was finally decided that electricity and steam be purchased from the Pennsylvania Railroad. Since the live steam furnished by the Pennsylvania Terminal would have to be reduced in pressure before it could be used for heating, it was decided to install a single engine-driven generator rated at 500 kw. which

*It is estimated that 225,000,000 lb. of steam and 5,000,000 kw.-hr. of electricity will be needed each year in the completed hotel.

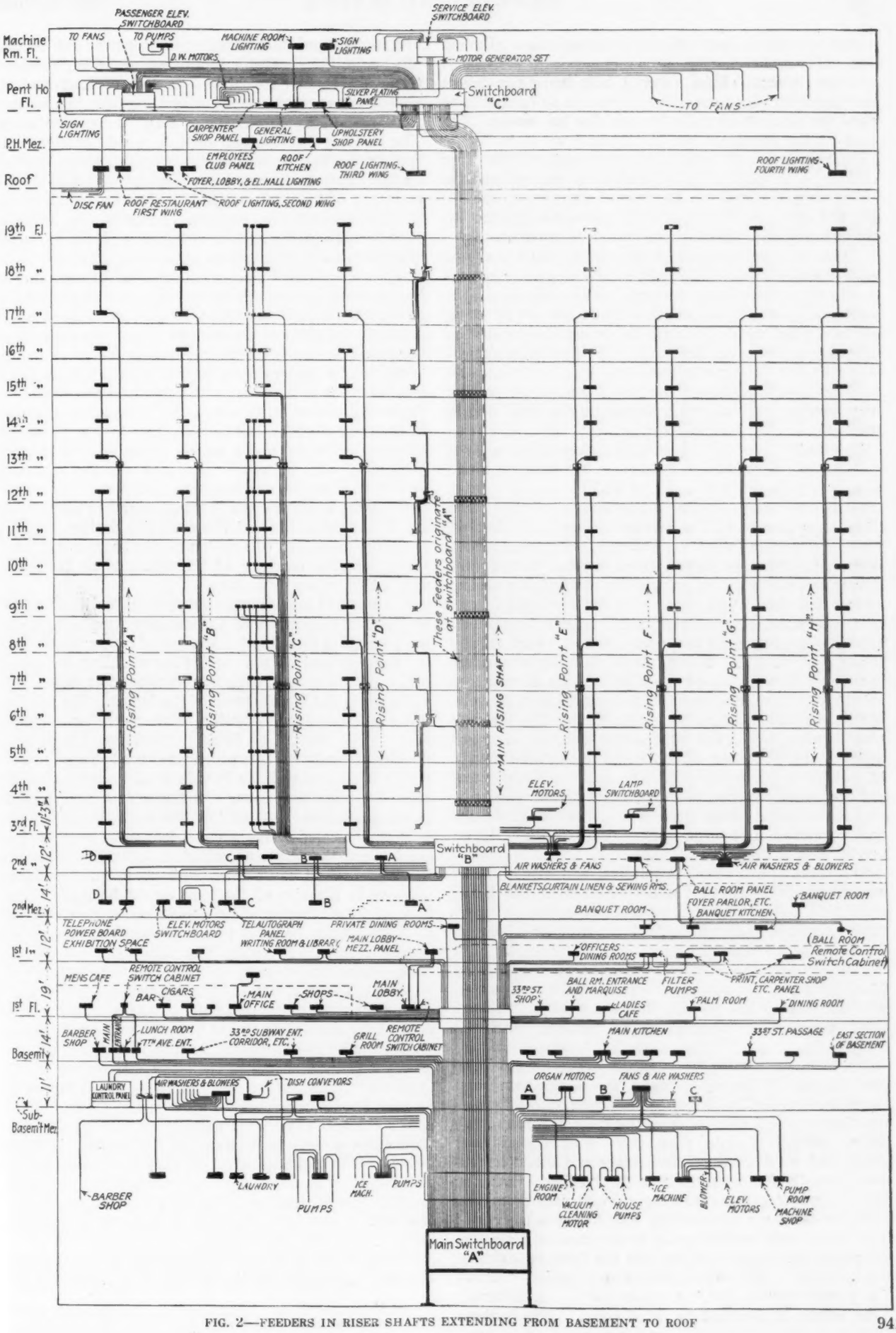


FIG. 2—FEEDERS IN RISER SHAFTS EXTENDING FROM BASEMENT TO ROOF

would serve as a very efficient reducing valve. During the cold weather it can be run to generate electricity, and the exhaust steam from it and the steam-driven refrigerating plant, air compressors and so forth can be used for heating by radiation and for hot water. The load on the generator can be adjusted so as to supply just the amount of exhaust steam required. On very cold days it can be loaded almost to rating, and on warm days the load can be reduced an amount depending on how nearly the steam requirements compare with the exhaust from the other steam-driven apparatus.

Electrical requirements in addition to the amount of energy which can be furnished by the generator operating in this way during the cold season and all of the energy supply required at other times are met by using electricity purchased from the Long Island City station of the Pennsylvania Railroad. By this arrangement steam and electricity can be secured at a minimum cost without installing boiler equipment and a generating plant large enough to supply the entire electrical load in the hotel.

Electricity from the Long Island City plant is received in the form of 11,000-volt, 60-cycle, three-phase alternating energy through a tunnel which terminates at a transformer room in the sub-basement of the hotel. This room is a small compartment completely shut off from the remainder of the building. It contains two sets of transformers, one of which supplies three rotary converters, while the other supplies the lighting system and small motors. The rotaries are for supplying energy to the elevators, ventilating fans, laundry machines, auxiliary house pumps and sump pumps, which require speed control. The transformers for the converters consist of three banks of three units, each of which is rated at 187 kva. and has two secondary taps, 58 volts for starting and 188 volts for running. The lighting transformers, which are rated at 250 kva., are arranged in two banks of three each and energize 240--120-volt, three-wire lighting circuits. The high-tension circuits are controlled by type B-2 oil circuit breakers, disconnecting switches being provided so that some of the transformers can be thrown out of service without interfering with the operation of the rest.

The rotaries are rated at 500 kva. and supply direct current for 230-115-volt, three-wire circuits. Each has a starting switch mounted on a panel beside it. Two rotaries will be able to handle the power load, leaving the third as a spare.

The generator previously mentioned is driven by a 24-in. by 32-in. (61-cm. by 81-cm.) Corliss engine that runs at the very low speed of 120 r.p.m. so as to insure quiet operation. It operates in parallel with the rotaries.

Switchboards and Distribution.—There are two switchboards in the engine room, the power board and the main distributing board. The power board handles the direct-current circuits from the rotaries and the two main lighting circuits (one from each transformer bank) and carries the meters, relays and other instruments for the high-tension side of the line. Both the rotary circuits and the lighting circuits pass from this board to the main distributing board, which is divided into three main sections—the power-receiving section, the power-distribution section and the lighting-distribution section. The power-distribution section controls the power circuits for the lower floors. A kilowatt-hour meter is mounted on each panel. The busbars are so arranged that direct-current power can be supplied from the generator to any rotary or any combination of these four machines. In case of failure of the alternating-current supply, direct current can be used for lighting the corridor and other emergency lamps. The lighting-distribution section, which receives current from either or both banks of transformers, controls all the lighting circuits in the hotel. The various circuits are distributed among the phases so that an approximate balance is secured. Some of the lights in each corridor and at other emergency points are operated from each of the three phases, so that the failure of one or even two phases will not put any portion of the building in complete darkness. Each phase, as well as the main line, is provided with a kilowatt-hour meter.

As all the elevator motors are installed in two penthouses on the roof, the energy supply for these motors is carried by feeders from the main switchboard in the sub-basement to a power switchboard on the roof floor. From this power switchboard the feeders are extended to separate distributing boards, one in the passenger elevator penthouse and a second in the service elevator penthouse. A switch is provided on the roof-floor switchboard so that the feeders supplying the passenger and service elevators may be tied together electrically. By taking advantage of the diversity factor resulting from the operation of two banks of elevators the combined carrying capacity of the two sets of feeders is utilized to better advantage.

In the design of the feeder system for lighting the size and arrangement of the feeders were determined with a view to reducing the amount of copper required to a minimum and at the same time avoiding the possibility of having such variation in voltage as would seriously affect the candlepower of the lamps. The consulting engineer engaged by the hotel operating company had a large amount of data on the demand factors of feeders of various hotels which were used in conjunction with the connected loads in this hotel to determine the size of feeders necessary. As the variation in candlepower is much more rapid that the variation in voltage, it is obvious that if too great a loss were permitted in the feeders, the resultant reduction in light produced in the lamps might cause complaints from guests and an increase in the size of the lamp would be made necessary. On the other hand, good engineering required that no more copper be used than was necessary to obtain proper results. Economy was also obtained in the branch-circuit wiring by putting as many as ten to twelve outlets on a circuit. This is permissible in a hotel for the reason that all of the outlets are very seldom used at the same time in the bedroom portion of hotels.

*Illumination.**—The main feature in the way of illumination is the lighting of the lobby. There the ceiling is of glass arranged in an attractive design, supported on steel framework. Special glass in two colors is used, and in the space above the glass are a number of lamps with efficient reflectors, arranged for control in three groups. The lighting effect is very attractive and is obtained with an unusually small expenditure of energy for this type of lighting. Standard floor lamps are also provided in the lobby for use in connection with the lighting above the glass ceiling.

Charles E. Knox was consulting engineer for the hotel and was responsible for the design of the electrical and

*Other features of the illuminations will be discussed in the next installment of this article.

elevator equipment of the hotel. Tenney & Ohmes were the heating, ventilating and refrigerating engineers. L. K. Comstock & Company, Inc., handled the entire electrical construction work, O. Chevalier acting as superintendent of the work. The American Laundry Machine Company equipped the laundry. Watt-hour meters were furnished by the Sangamo Electric Company, and sockets, receptacles, etc., were supplied by the Bryant Electric Company. The elevator equipment was furnished by the Otis Elevator Company, electric cooking and warming equipment was supplied by the Duparquet, Huot & Moneuse Company, the electrically operated dishwashers by F. G. Street, and motor-driven food mixers by the Hobart Manufacturing Company. The Westinghouse Electric & Manufacturing Company furnished about all the rest of the electrical equipment—power-plant equipment, motors, panelboards, etc. The George A. Fuller Company built the hotel.

FIG. 3—ILLUMINATION FEATURES OF PUBLIC ROOMS

A—Entrance to lobby lighted by one large fixture. B—Main lobby illuminated by lighting units behind glass roof. C—Ballroom illuminated by two large fixtures and side lamps. D—Main dining room with concentrated illumination. E—Grill room illuminated with ornamental fixtures. F—Palm garden adjoining main lobby.

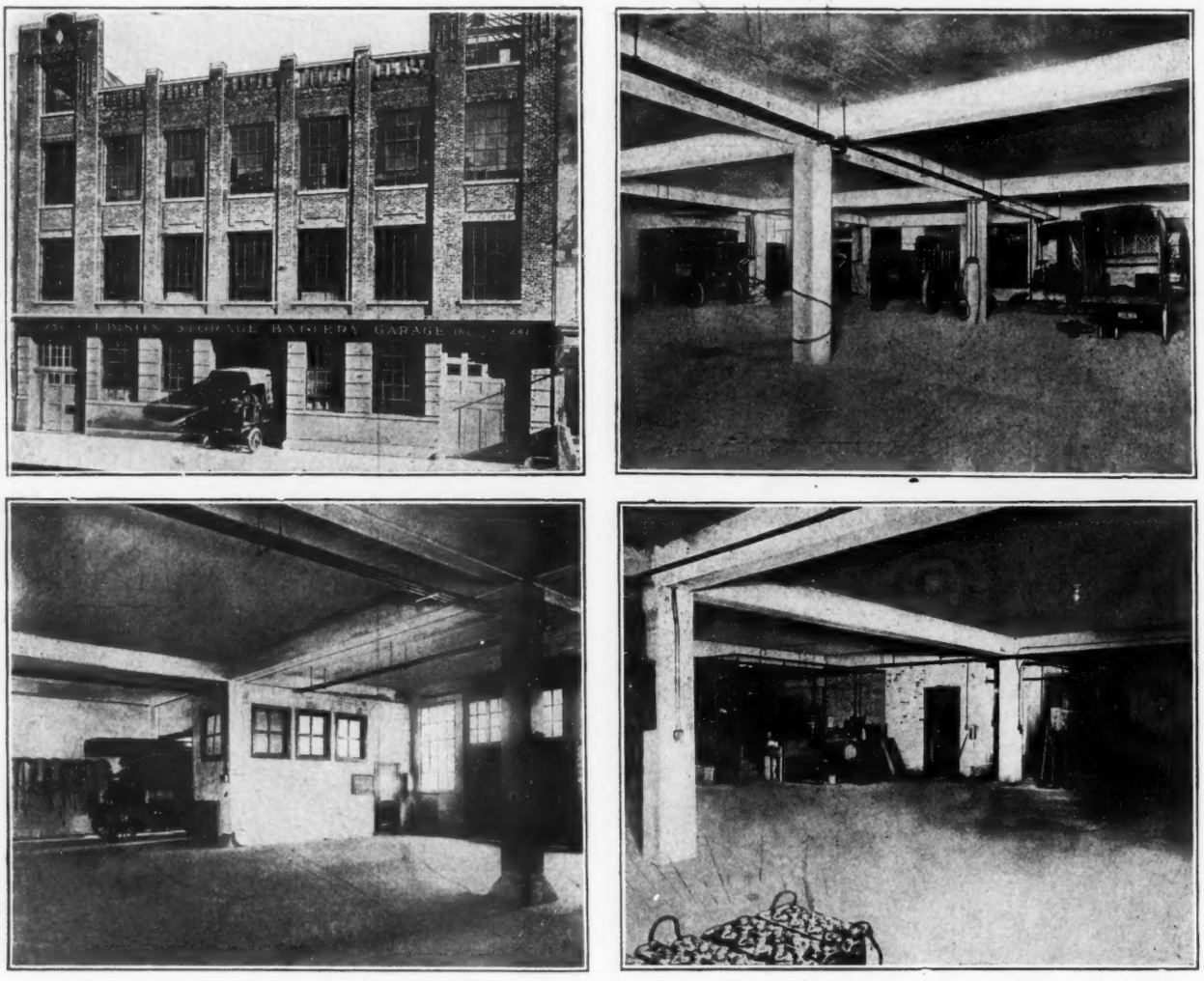
A 110-Truck Electric Garage

Description of Three-Story Building Designed to Keep Trucks in the Maximum Length of Service by Giving Proper Attention to Battery Charging and Truck Maintenance

WHENEVER central-station men meet to discuss the promotion of electric street trucks and delivery wagons there appears to be a unanimity of opinion that the successful operation of commercial electric vehicles in any community is predicated on there being the right kind of a garage operated by or under the auspices of the local electric light company. There are certain instances of electric light companies operating electric garages. In the following paragraphs a garage put up by one of the prominent manufacturers of storage batteries solely for electric street trucks is described.

This garage has been separately incorporated and is known as the Edison Storage Battery Garage, Inc., and it is situated at 247-251 West Thirty-fifth Street, New York City. The building is three stories high and has a basement. It is constructed of reinforced concrete and is 69 ft. (21 m.) wide by 98 ft. 9 in. (30 m.) deep. Each of the three stories is devoted to regular garaging purposes, while in the basement there is a repair plant. A 7-ton elevator serves to take trucks from the ground floor to other floors. On each floor there are six supporting concrete columns, and on each of these are double charging plugs from which current of any desired amperage may be had. There is also a washstand on each floor where soap and warm water for washing the trucks are provided.

In the basement a locker for each driver is provided. There is an additional panelboard with provisions for battery discharging. A small repair shop has been set up, in which are a drill press, a gear press, a power emery wheel and a lathe. With the equipment on hand it is stated that all repairs on cars as well as on batteries can be made. A stock room for batteries and battery parts has been installed. In a small fireproof room all oils and greases are kept. Along a portion of



VIEW OF OUTSIDE AND SOME OF THE FLOORS OF THE GARAGE

The charging panel is in the room next to the elevator on the ground floor, lower left hand. The upper right-hand cut shows charging plugs and part of repair floor. Lower right-hand cut shows machine shop and one corner of battery repair department.

one side of the basement there is a battery room where all battery overhauling, solution changing and minor repairing is done. In this room there is a small charging bench for small batteries. Space is provided in the basement also for storing solution drums and battery trays. A 5-gal.-per-hour still has been installed to provide distilled water as required. There are also an automatic water heater and a steam producer. All battery cleaning is done with steam.

Contracts are based on three different rates, as follow:

1. Dead storage. The rates per month in this case are as follows: 750-lb. vehicle, $17.50; 1000-lb. vehicle, $20; 2000-lb. vehicle, $22.50; 4000-lb. vehicle, $25; 7000-lb. vehicle, $27.50; 10,000-lb. vehicle, $30. This rate includes housing only. Energy for charging will be supplied upon written request at 8 cents per kilowatt-hour, including watering of battery. Other services and supplies will be furnished, upon written request, at transient rates.

2. Full service, including charging. Rates per month are: 750-lb. vehicle, $43; 1000-lb. vehicle, $48; 2000-lb. vehicle, $53; 4000-lb. vehicle, $65; 7000-lb. vehicle, $75; 10,000-lb. vehicle, $85. This rate includes housing, washing and polishing, oiling and greasing, monthly inspection of vehicle and battery, watering and regular charging of battery. It does not include repairs to vehicle or battery nor other services of any kind. Repairs will be made only on the written orders of the owner.

3. Full service, charging extra. Rates per month are: 750-lb., 1000-lb. and 2000-lb. vehicles, $25; 4000-lb. vehicle, $30; 7000-lb. and 10,000-lb. vehicles, $35, plus 5 cents per kilowatt-hour for energy consumed in charging. This rate includes everything included in rate No. 2 except that charging is extra, according to the actual energy consumption.

There is a contract rider covering emergency repairs which authorizes the garage to make emergency repairs without formal orders, but not to exceed $25 in cost for any single job.

On the back of each contract appear the following terms and conditions:

1. This agreement shall not be binding upon the garage company until accepted in writing by its proper officer or duly authorized agent.

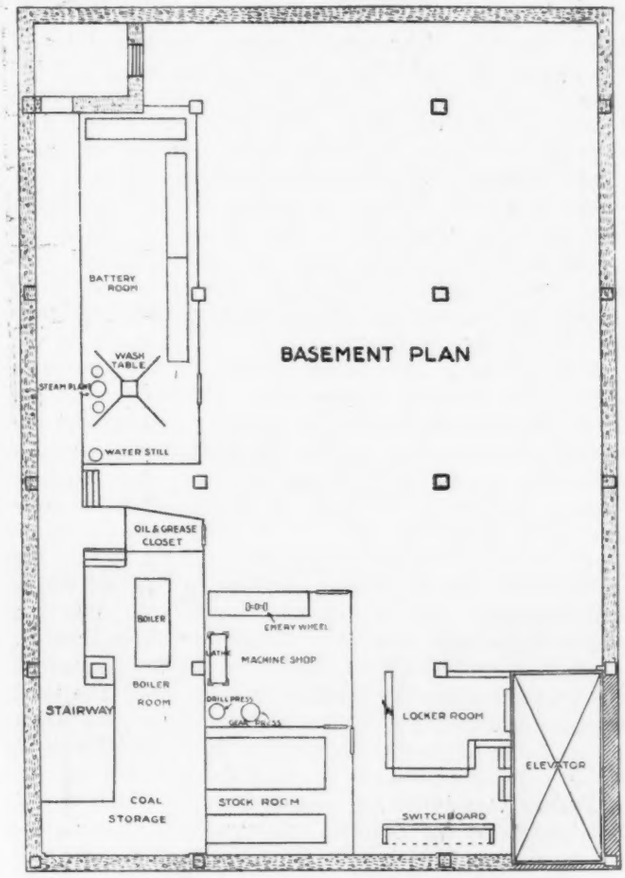
2. The garage company will endeavor to have the battery in the vehicle fully charged by 7 o'clock each morning (except Sundays and holidays unless especially requested in writing) but does not assume responsibility for failure to have the battery so charged.

3. The garage company shall not be responsible for damage by fire and shall not be responsible for any other damage unless caused solely by the negligence of its agents or employees.

4. The garage company shall not be responsible for damage to or the loss or theft of articles or goods left in the vehicle or the garage.

5. The garage company will furnish at the garage for the use of the vehicle owner or his agents or employees during the life of this agreement a locker provided with lock and key, for the sum of $1 per year or fraction thereof, but assumes no responsibility for the safety of articles therein.

6. The garage company will from time to time make such rules and regulations as may be found necessary for the proper operation of the garage, and the vehicle owner agrees for himself, his agents and employees to be bound by them during the life of this agreement.



RELATIVE SPACE OF LOCKER, STOCK AND BATTERY ROOMS AND MACHINE SHOP

G1011P3C-119

Contract No. F.....

ELECTRIC VEHICLE GARAGE AGREEMENT

Edison Storage Battery Garage, Inc.

Main Office, Orange, N. J.

Garage, 247-251 West 35th Street, New York City

New York, ...19....

The undersigned requests the Edison Storage Battery Garage, Inc. (hereinafter called the "Garage Company") to furnish garage service, as indicated below, for.....vehicle, capacity.....lbs. Owner's No.....(MAKE), Mfrs. No.....(MAKE), equipped with.....battery containing .....cells, type.....and, subject to the terms and conditions endorsed hereon, and made a part hereof, agrees: To be bound by this agreement until terminated as herein provided; to pay for such service monthly upon presentation of the bill; that the service shall include only the service indicated below and shall be charged for at the rate indicated below:

RATE F—Full Service, Including charging.

750 lb. vehicle	$43.00	per month
1,000 " "	48.00	"
2,000 " "	53.00	"
4,000 " "	65.00	"
7,000 " "	75.00	"
10,000 " "	85.00	"

This rate includes housing; washing and polishing; oiling and greasing; monthly inspection of vehicle and battery; watering and regular charging of battery. It does not include repairs to vehicle or battery nor other service of any kind. Repairs will be made only on written order of owner.

In case of any question regarding vehicle call Mr.....

Phone....., No....., or Mr.....

Phone....., No.....

Signed.....

By.....

Title.....

Accepted.....19.... (Address for Bills)

EDISON STORAGE BATTERY GARAGE, Inc.

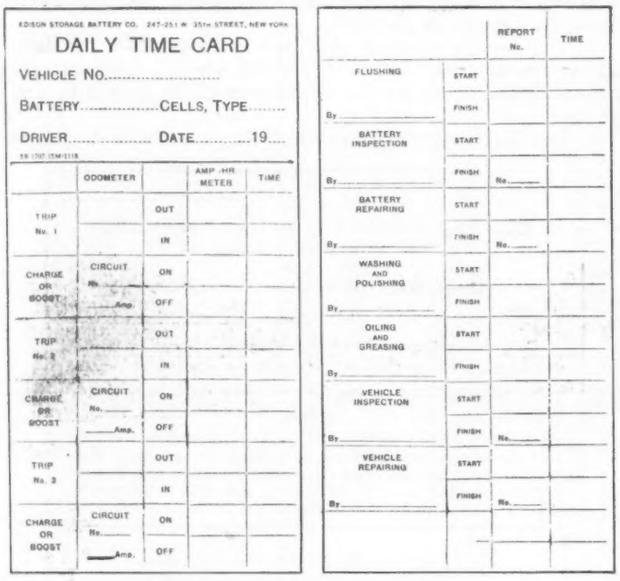
By..... (Address for other Communications)

ALL SERVICES USE THE SAME CONTRACT FORM EXCEPT FOR THE RATE PANEL

7. This agreement may be terminated by either party at any time by one week's notice in writing to the other party. The garage company reserves the right to terminate this agreement forthwith in case of arrears in payments due from the vehicle owner, or in case of failure on the part of the vehicle owner, his agents or employees to observe the rules and regulations of the gagage.

8. This agreement shall not be binding on the garage company if the form or rates are altered in any way, unless with the written consent of an officer of the garage company.

An interesting feature of the operation of the garage is the daily time card. Each driver must punch the time clock on his card each time he takes his truck out and brings it in. The amount of charge or boost is recorded on the card. On the reverse side space is ruled off for such details of maintenance as flushing battery inspection, battery repairing, washing and polishing, oiling and greasing, vehicle inspection and vehicle repairing. At any time these daily cards will show at a glance the history of each vehicle using the garage service. After a few months they will also provide some interesting statistics of operation. On the first floor there is walled off in a small room a six-panel Cutler-Hammer charging board. Each circuit is plainly marked, and any desired charging current may be obtained. No circuit is rated at less than 100 amp. and the heaviest circuit is rated at 270 amp. A daily charging record is kept of each circuit.


EDISON STORAGE BATTERY CO. 247-251 W. 35TH STREET, NEW YORK

DAILY TIME CARD

VEHICLE NO.....

BATTERY.....CELLS, TYPE.....

DRIVER..... DATE.....19....

	ODOMETER		AMP.-HR METER	TIME
TRIP No. 1		OUT		
		IN		
CHARGE OR BOOST	CIRCUIT No.___ ___Amp.	ON		
		OFF		
TRIP No. 2		OUT		
		IN		
CHARGE OR BOOST	CIRCUIT No.___ ___Amp.	ON		
		OFF		
TRIP No. 3		OUT		
		IN		
CHARGE OR BOOST	CIRCUIT No.___ ___Amp.	ON		
		OFF		

		REPORT No.	TIME
FLUSHING	START		
By_____	FINISH		
BATTERY INSPECTION	START		
By_____	FINISH	No.___	
BATTERY REPAIRING	START		
By_____	FINISH	No.___	
WASHING AND POLISHING	START		
By_____	FINISH		
OILING AND GREASING	START		
By_____	FINISH		
VEHICLE INSPECTION	START		
By_____	FINISH	No.___	
VEHICLE REPAIRING	START		
By_____	FINISH	No.___	

FRONT AND REAR OF DAILY TIME CARD

There is room in the garage for 110 trucks. Already, after about four months of operation, seventy trucks are utilizing this service.

The same conditions have existed in New York that obtain elsewhere. Gas-car interests operate the garages, and in them the electric car does not receive the required attention. Batteries cannot be charged in the same manner that a gasoline tank is filled. Batteries should be charged at a certain rate. If panels are not large, as seems to be the case in gas garages, proper charging does not result. Instances of charging a 45-amp. cell at a 15-amp. rate from a 30-amp. board are not uncommon. Cars must be kept in condition if they are to be of service to their owners. It is this fact that causes the statement that central stations must conduct the electric garages if electric commercial transportation is to be a local success.

The garage described was built to better the conditions of electric transportation in New York City by giving a better service to the operator of large fleets and to provide a place where the prospective user of one or two electric trucks will be assured that his trucks will be cared for properly. This service embodies many new features and ideas which are the outcome of years of observation of the many deficiencies of service that have retarded the growth of the electric vehicle industry.

WIRELESS TELEPHONY AND TELEGRAPHY IN THE WAR

Engineer Believes Commercial Applications of Radio Development Accelerated by War Will Lie Only in Field Unreached by Wire Lines

A. A. Oswald, Western Electric Company, New York City, speaking before a joint meeting of the Chicago Section, A. I. E. E., and the Electrical Section, Western Society of Engineers, at Chicago, April 28, described much of the radio apparatus and organization utilized by the military establishment of the United States in the recent war. The speaker showed lantern slides of the equipment used by all sections of the army and the navy for both aircraft and ground uses. He showed how the ground telegraph, using earth waves instead of atmospheric waves, made it possible to utilize radio communication even in the forward areas of a battle zone where it was impossible to keep aërials from being shot down by the enemy. He also showed how the messages received from these ground telegraph sets were communicated to the back areas by aërial-radio communicating sets established at regimental, brigade and division headquarters.

A particularly interesting section of the speaker's address was devoted to anecdotes on radio camouflage. To show the workings of this peculiar art he first described the method by which air craft, equipped with radio sets, can utilize the waves sent out from sending stations as direction finders. It appears that the Germans were using this method of guiding their Zeppelins in the night air raids on London. These enemy air craft would tune to certain stations in London which were sending continuously and would then use the waves coming out from these stations to guide them to the British capital. When the Allied armies discovered this procedure they took pains to learn when the next Zeppelin raid was to be put on and to learn what station in London was to be the "beacon" station. On the night of the raid this station was shut down and a station in France was tuned to send out waves which would be mistaken by the Zeppelin commander for those coming from the British station. By thus leading the Zeppelins astray it was possible for the Allied armies to trap them and to destroy all five of the raiders.

In commenting on the possible commercial application of recent radio developments Mr. Oswald expressed the belief that unless some vitally new principle was discovered in connection with radio it would not come to be a serious competitor with wire lines. It will be used for communication between ships at sea, between ships and the land, between aircraft and between sections of isolated country over which it is difficult to lay wire lines. It will find use wherever there is a demand for telegraph or telephone service and where wire lines are not available.

Third Joint Convention on Pacific Coast

Progress of Co-operative Campaign, Preparation of Industry for Standardizing Steam-Railroad Electrification Methods, Interconnection, Commercial Conditions and Plan for Reorganization of the N. E. L. A. Are Discussed

This report supplements an article printed in last week's issue of the ELECTRICAL WORLD. It gives details of later sessions of the joint convention at Coronado, Cal., last week by the Pacific Coast Section of the National Electric Light Association, the Pacific division of the Electrical Supply Jobbers' Association and the California Association of Electrical Contractors and Dealers.

SUPPLEMENTING last week's account of the joint electrical conference at Coronado, Cal., details of later sessions have been received. Participation in conference affairs by members of the Railroad Commission, the Industrial Accident Commission, the water committee and others made for comprehensiveness and breadth of view in discussions. Economic questions sometimes crept in, as when the president of the Railroad Commission volunteered some unofficial comments in the engineering session. Authoritative expression was the rule on all matters considered, because practically all California companies were represented by their leading men.

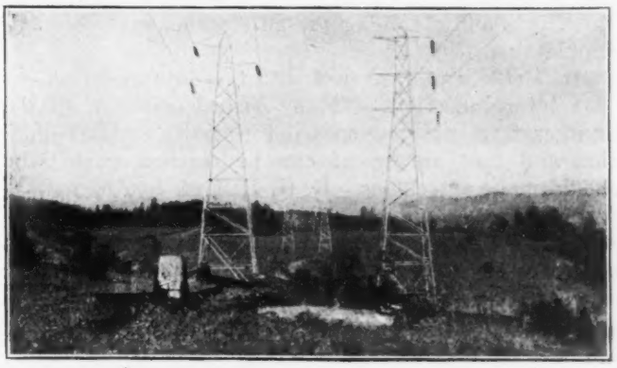
There was much praise from all quarters for the co-operative campaign, which has been steadily expanding and now has four field men at work in an effective plan for increasing the sale and use of electrical appliances. Some of the suggestions made by Samuel Kahn, president of the California Section of the National Electric Light Association, were that membership in classes D and E should be made more attractive, that companies should offer to make consumers "financial partners," that more attention should be given to publicity, and that a study be made of busbar interconnections that would improve the prospects for serving railroad electrification projects. He stated clearly that he would rather see the powers of the Railroad Commission broadened than curtailed and mentioned the desirability of putting municipally owned utilities under its jurisdiction.

STANISLAUS FLUME, SIERRA & SAN FRANCISCO POWER COMPANY

Reports by the secretary and the treasurer showed the section to have weathered the war in excellent condition. Two particularly creditable developments of war times were the salvage bureau planned as an equipment clearing house and the personnel bureau as a clearing house for men. The satisfactory membership condition despite enlistments is due to its active coöperation in getting in new members, a shining example being the total of 329 class B members secured in one company as the result of concentrated effort and team work.

ENGINEERING COMMITTEE DISCUSSIONS

In reporting for the engineering committee at the general session H. A. Barre, Southern California Edison Company, chairman, said that the committee's most important work will be in preparing the industry for standardizing steam-railroad electrification methods. Although this is a national question, it will be a particularly live one in the Southwestern States. It is very desirable to have power systems so built that they can be utilized effectively in the electrification of railroads. Four interests are involved—railroads, power companies, manufacturers and regulatory powers.



TOWER LINES NEAR VALLECITO, SIERRA & SAN FRANCISCO POWER COMPANY

The engineering sessions began Thursday afternoon, the first report to be considered being that of the committee on insulators. C. O. Poole, Southern Sierras Power Company, said that, out of 10,000 insulators in service, 98 per cent of the failures were between pin and cap. He suggested the continuation of engineering committee tests, using insulators of modern design. It was also suggested that particular care be taken in recording the type and location of failures with respect to metal parts.

J. P. Jollyman, Pacific Gas & Electric Company, referred to the great need for better field-test methods. Insulators shown to be doubtlul under megger tests would often be shown by laboratory methods to be still fit for many years' service.

C. P. Osborne, Portland Railway Light & Power Company, said that advice from high authority had been to remove all insulators testing below 2000 megohms. This seemed too expensive a plan, so the limit was reduced to 200 megohms, and with this standard there were practically no failures in two years. The subject brought out prolonged discussion, experience with different designs and makes being exchanged and the latest word from manufacturers' representatives being listened to with interest.

Others who contributed to the discussion were E. B. Snyder, Ohio Brass Company; H. L. Garbutt, Westinghouse Electric & Manufacturing Company; R. J. McClelland, Electric Bond & Share Company; J. A. Lighthipe, Southern California Edison Company; J. E. Woodbridge, Sierras & San Francisco Power Company; D. J. Butts, Western Electric Company; John Koontz, Great Western Power Company, and R. S. Masson, Arizona Power Company.

The committee on transformer standards suggested that subtractive polarity of transformers be made standard for all types and that three-phase transformers be provided for distribution service.

Discussing the paper by G. R. Kenny, San Joaquin Light & Power Company, on the interchange of power between that company and the Los Angeles system, E. O. Edgerton, president California Railroad Commission, suggested that a possibility now faced is the consolidation of companies as a means of avoiding difficulty over extensions and obtaining for all stockholders the maximum return.

Mr. McClelland disagreed with this idea, pointing out that interconnection of many years' standing in the Southeast has not developed the necessity for consolidation and that agreement can be reached as to who should make extensions. R. H. Ballard, Southern California Edison Company, cited as an obstacle to consolidation outstanding capitalization and the time required to apportion this satisfactorily.

Edward Whaley, Northern California Power Company, pointed out that the chief problems of consolidation are on the financial side and that physical interconnection, which can be effected much more quickly, secures the same benefits so far as service to the public is concerned. A difficulty of interconnection is that line troubles are carried over into other systems. Mention was made of the desirability of interconnection at more than one point, or assigning one or more generators exclusively to the system with which power is to be exchanged. The next sudden increase in power demand was likely to be for the electrification of railroads.

Others who expressed views on the question were Perry O. Crawford, California-Oregon Power Company; D. D. Morgan and J. R. C. Wood, Southern California Edison Company.

The engineering committee did not approve of applying on the Pacific Coast the line safety code of the United States Bureau of Standards. A code better suited to local needs had therefore been prepared and submitted to the Railroad Commission with the recommendation that it be adopted as California's standard. L. S. Ready, California Railroad Commission, said that the matter was being studied. His opinion was that a code prepared locally would be of greater value than any code issued by the Bureau of Standards, because the latter would have to be complex to be applicable to so large a territory.

Relay Protective Systems and Other Topics

At the afternoon session, in discussing the paper by G. E. Armstrong, Southern California Edison Company, on relay protective systems, there was difference of opinion as to whether any possible combination of relay switches now made would meet all requirements on Western systems. It was urged that relays depending on the amount of voltage or current be avoided in favor of those operative on relative values of current.

Several companies had developed equipment that suited their needs better than standard apparatus, and it was pointed out that Western engineers must frequently design their own apparatus to meet requirements previously unknown. Mr. Woodbridge suggested that relays "should not be taken too seriously" as heavy short circuits will run through anyway. On the Southern California system short-circuit charges are plotted on a distribution system map to enable a study of the nature and extent of the currents that run over the lines at such times to be made.

R. H. Halpenny, Southern Sierras Power Company, showed how the importance of relay protection has grown as system networks have extended. Several speakers thought the manufacturer should give more attention to the relay protection field.

The paper on automatic inductor-generator plants by E. A. Quinn, San Joaquin Light & Power Corporation, brought out general agreement that automatic substations require a reasonable amount of intelligent attention. Paul Lincoln, Westinghouse Electric & Manufacturing Company, pointed out that this attention increases with the size of the installation, approaching a limit in large plants, where constant attention would probably be economical.

John Hood, General Electric Company, showed that operating expense is the one charge on which there remains a field for considerable economy increases. Because they affect this charge, automatic substations will influence as they increase in size the comparative studies of the proposed steam and hydroelectric plants in the matter of fixed and operating charges which are being made. Mr. Hood expects to see an increase toward larger automatic substation sizes.

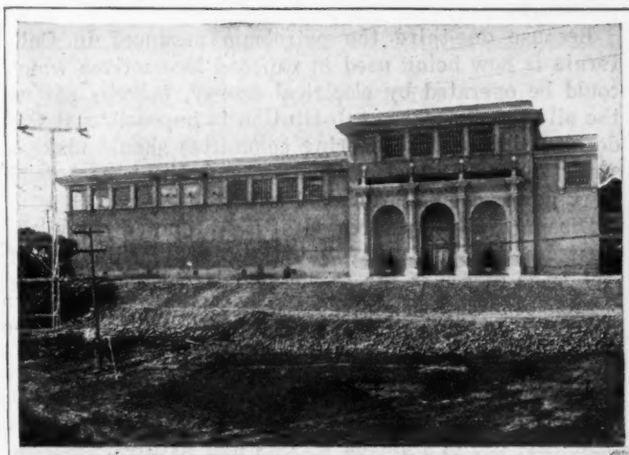
Other papers discussed at this session were on connecting a steam plant to stand-by operation, by L. M. Klauber, San Diego Consolidated Gas & Electric Company, and on the meaning of kilowatt-hours per barrel of oil, by S. J. Lisberger, Pacific Gas & Electric Company.

At the Friday afternoon session there was an interesting demonstration of noise-proof telephone transmitters, and Mr. Lighthipe suggested these would be very useful means of communication for power-station operators, enabling them to talk from the switchboards instead of going to sound-proof booths. Mr. Barre said the investigation of the same principle as a means of mitigating inductive interference should be carefully followed. In discussing the paper on powdered fuel by C. H. Delaney, Pacific Gas & Electric Company, R. J. C. Wood, Southern California Edison Company, brought out the need for considering the dust problem in comparing coal and oil fuels. The high sulphur content of pulverized California coal should be considered in relation to its sulphuric-acid action on boiler tubes.

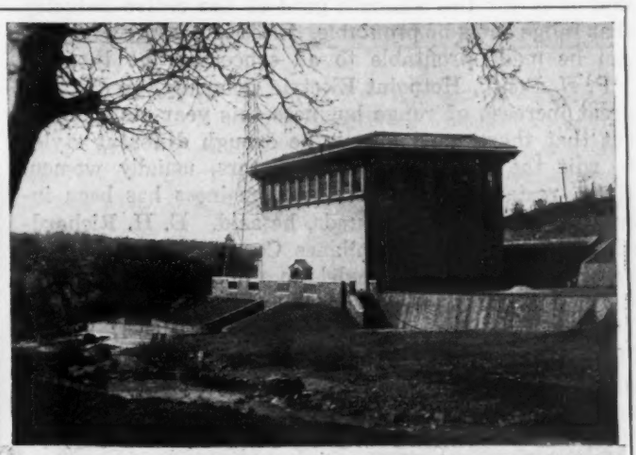
Paul M. Donning, Pacific Gas & Electric Company, felt that more complete tests of pulverized fuel on a large scale are needed. Mr. Lisberger spoke of the large first cost necessary in equipping plants to use this fuel and the storage dangers involved. Comment was also made by H. E. Linden of the Beckman-Linden Corporation and J. A. Buell, Lone Coal Mine Company.

Brief discussion of the paper on extending the accuracy range of watt-hour meters by O. A. Knopp, Pacific Gas & Electric Company, was followed by the paper on electric welding by John Hood, General Electric Company. F. A. Anderson, United States Shipping Board,

called attention particularly to the metallic theory involved. W. B. Sawyer, United States Steel Products Company, pointed out that no one specification of electrode material could meet all requirements. The three considerations in proper electrode combinations are character of material, chemical composition and physical structure. Further discussion was followed by a visit to the electric welding apparatus brought by Mr. Hood, which was used to illustrate welds which were homogeneous and well connected to the parent metal.

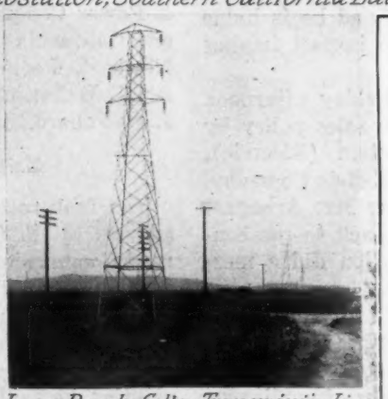


Cordelia Substation, Napa District, Pacific Gas & Electric Co.



Wise Power House, Pacific Gas & Electric Co.

Colton Substation, Southern California Edison Co.



Long Beach-Colton Transmission Line Southern California Edison Co.

COMMERCIAL SESSIONS

Reporting for the commercial committee, A. W. Childs, Southern California Edison Company, chairman, referred briefly to recent extensive changes in conditions. During the war most companies found it unnecessary to solicit business. Many isolated plants were voluntarily shut down and central-station service was substituted. Now an era of unprecedented development of resources is faced, and the companies must set their house in order as it were, giving careful attention to the sales personnel, interesting the architect in providing suitable arrangements for electrical needs and in other ways preparing to meet new conditions.

At the first commercial session on Thursday morning the paper on proper training of the sales personnel by L. H. Newbert, Pacific Gas & Electric Company, was discussed by John A. Britton, Pacific Gas & Electric Company, who said that the primary qualification of a salesman is ability to approach prospective customers with convincing presentation. Closer contact between the salesmen and executives of the company was urged. Every salesman should know the company policy and should learn it from the boss.

K. E. Van Kuran, Westinghouse Electric & Manufacturing Company, made the point that the all-important feature of any business, particularly the electrical trade, is service, and this can only be rendered through the properly coördinated efforts of every person and department. An understanding of human nature is the first consideration in the selection of salesmen. One who meets this requirement can be expected to learn the other essentials. Mr. Van Kuran emphasized the need of leaders who can develop a spirit of loyalty in employees. Employees render loyalty in the same measure as they receive it. Others who commented on the subject were Mr. Ballard, E. B. Criddle, Southern Sierras Power Company, and Glenn D. Smith, Ontario Power Company.

A paper on how the electrical industry can assist the architect in serving his clients by J. O. Case, General Electric Company, was heartily approved as an aid in much-needed progress. Mr. Eltringham of the State Accident Commission stated that a standard code which had been considered for two years would soon be submitted. He requested coöperation. Glen Arbogast, of the F. E. Newberry Company, said that about 5 per cent of the cost in building construction now goes for electrical work and that this percentage could be doubled by proper coöperation with the architects.

The paper on problems of electric cooking and heating by B. M. Maddox, Southern California Edison Company, was the center of as much interest as any paper before the convention. A. B. Wollaber, Southern California

Edison Company, said this company now has more than 3000 electric ranges installed and working. His experience indicated that ordinarily there was no more trouble with ranges than with motors and other apparatus. Written discussion from J. J. Gibson, Westinghouse Electric & Manufacturing Company, suggested that it is for the ultimate good of the entire industry that range rates be profitable. Electric heating of water can be made profitable to all concerned, he thought.

P. H. Booth, Hotpoint Electric Company, predicted a great increase of range business this year and pointed out that there must always be enough different styles to suit the fancy of the purchasers, usually women. Hotel, restaurant and bake-oven business has been increasing by leaps and bounds, he said. E. H. Richardson, Edison Electric Appliance Company, thought that keeping the number of models to a minimum would hold the cost down.

Others who spoke on this subject were Glen D. Smith, M. A. Delew, electrical contractor, and R. C. W. Libbey, Simplex Electric Heating Company. There was also appreciative and general discussion on the paper by H. L. Harper entitled "Selling the Idea" and that by John C. Rendler entitled "The Contractor-Dealer of the Future."

"THE MAN IN THE STREET"

At a general session Thursday afternoon a paper entitled "The Man in the Street" was read by S. M. Kennedy, Southern California Edison Company. Some of the points made in this paper were as follows: If there is any class of business which is at all times on trial before the great court of public opinion, it is that of the public utility. The utility, however, cannot select its jurors; they are selected by the destiny that groups men together in cities and communities. The man in the street is a many-sided individual, but in the main he will be found reasonable, tractable and not unfriendly. He judges the company somewhat by the manner in which it maintains its property. An open, accessible office invites him to inspect, and he is liable to say to himself that an invitation to inspect implies that there is nothing to conceal.

The concluding commercial session Friday afternoon had two items—the paper on appliance sales policy by Tracy W. Simpson, Federal Sign System (Electric), and a talk by W. L. Goodwin, General Electric Company. In commenting on Mr. Simpson's paper Mr. Arbogast warned against any tendency to drift back to the conditions obtaining when the central station did a merchandising business on unethical lines.

Brief comment was also made by A. M. Smith, General Electric Company, and Mr. Booth, the former stating that he hoped to see a display room for samples maintained by the central station but sales of appliances made only by retail merchants. In reviewing the comment Mr. Simpson cited experience in one Coast city where no sales effort is made by the central station and where appliances used are exceptionally low and dealers are not prosperous.

Mr. Goodwin explained why the electrical business is unique and, in his opinion, must ultimately consist of a single organization, including all present branches of the industry, if the best results are to accrue. The first need is an educational campaign, he said. He highly commended the spirit manifested at this convention. The campaign of publicity must be national, and it is particularly desirable that the example of the Pacific Coast be reported to other sections not so far advanced.

A final joint session for resolutions and elections was held late Friday afternoon. The public policy committee report was made at this session by John A. Britton, Pacific Gas & Electric Company.

Among actions taken by the convention were the following:

Because one-third the petroleum produced in California is now being used in railroad locomotives which could be operated by electrical energy, thereby saving the oil for uses where substitution is impossible, it was decided that the engineering committee should make a study of railroad electrification and the preparatory work power companies should undertake.

Disapproval was expressed of the proposed establishment by the Bureau of Standards at Washington of standards of ethics for application in the West, where capable commissions already exercise jurisdiction.

All branches of the industry were "invited to cooperate in an educational campaign to inform the public, and particularly architects, as to the need of installing receptacles for appliances, rather than to depend on makeshift use of lighting sockets and fixtures."

A plan for reorganizing and decentralizing the N. E. L. A. which was presented by the executive committee and indorsed by the general session proposed the financial independence of each geographical section. At some later date representatives of the sections should meet, it was suggested, and determine the proper allotment for maintaining a national association, the plan being to keep the expenses of the national office at a minimum and to send communications to members solely through the geographic sections. The plan also proposed the elimination of national conventions, in lieu of which annual section meetings should be held from which delegates would be sent to a general executive committee meeting.

The election of officers for the ensuing year resulted as follows: President, A. G. Wishon, San Joaquin Light & Power Company; vice-president, E. R. Davis, Southern California Edison Company; vice-president, L. H. Newbert, Pacific Gas & Electric Company; secretary, A. H. Halloran, *Journal of Electricity*, and treasurer, J. F. Pollard, Sierra & San Francisco Power Company.

ENTERTAINMENT AND BANQUET

The feature of the banquet Friday evening was the address by E. O. Edgerton, president California Railroad Commission. He sounded a sharp note of warning regarding public ownership of utilities unless new ideals were established. Americans have demonstrated their habit of themselves undertaking that which others do not do to their satisfaction. It will be so with the utilities, he said. Unless the quality of service is truly the first and chief consideration the opportunity to serve will be taken away. Moreover, the public will be the sole judge as to whether that service is satisfactory. If there is any feeling that experience with federal control of railroads and telephones has killed the municipal ownership tendency, that idea should be dismissed at once. The public ownership idea will never be killed, Mr. Edgerton said, and if consumers find a difference between a utility operated for profit and one operated for service, there will be a demand for the latter. A monopoly is economically right, he said, and if the private utility dominates, it will be because the ideal of service is put above the ideal of profit.

STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

IMPROVING THE LIGHTING FROM STREET LANTERNS

Method That Permits Use of Ornamental Fixture and at the Same Time Gives Better Light Distribution

BY F. BRUEGGEMAN

Street-lighting installations in which lantern-type fixtures are mounted on post standards ordinarily give distribution of light like that shown in Fig. 2 (above) because the rays from the lamp are reflected uniformly in a circular area and as a rule are uncontrolled. Experimental work which has been carried on in connection with one of the larger installations of lantern-type street lighting has shown that it is possible to modify certain fixtures in order to secure better distribution of light like that shown in Fig. 2 (below). The result is accomplished by collecting the upward and downward rays from the incandescent lamp and reflecting them into useful directions, preferably parallel with the street or drive.

The apparatus which was used in this experimental work has been operated on city streets. It is shown both assembled and disassembled in Fig. 1. In this photograph *A* is the upper reflector, which, when the unit is assembled, sits closely over the series tungsten lamp *B* and reflects all direct rays, as well as reflected rays from the lower reflector *C*, into useful directions. The lower

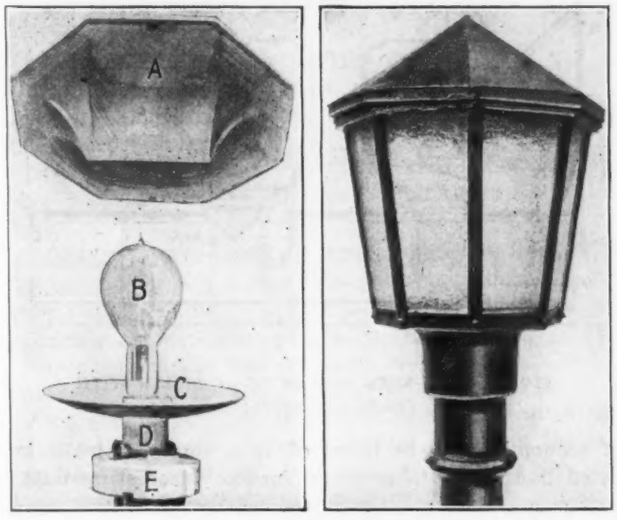


FIG. 1—UPPER REFLECTOR *A* SITS CLOSELY OVER LAMP *B* IN LANTERN ON RIGHT. *C* REFLECTS RAYS VERTICALLY AGAINST *A*

reflector *C* is parabolic and is designed to reflect vertically against reflector *A* all rays that strike it. *D* is a porcelain series socket of standard manufacture which fits into a specially designed porcelain combination cable terminal and receptacle *E*. The lead-covered cables terminate in this specially designed receptacle to make a safe and lasting installation. The complete lantern is constructed entirely of cast iron and glass, including the reflectors, which are white, fire-enameled and not affected by heat or rough usage. Chipped glass

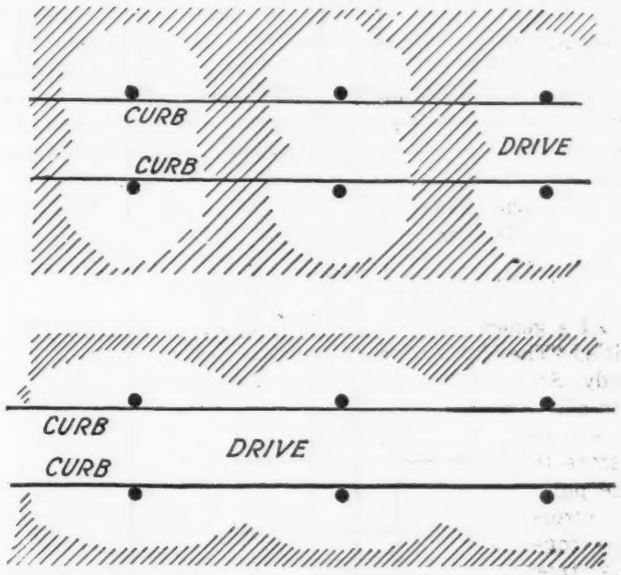


FIG. 2—REFLECTOR CHANGES LIGHT DISTRIBUTION OF STREET LANTERN FROM UPPER TO LOWER CURVE

is used in the lantern because it eliminates glare and does not offer much resistance to the rays. A broken-glass panel in lanterns of this design may be readily replaced by merely tipping over the hinged top, pulling out the broken glass and sliding the new panel into place.

SAFETY MEASURES FOR PROTECTION OF LINEMEN

Central Station Discards Rubber-Hose Insulation on Primary-Pole Connections in Favor of Specially Insulated Stranded Wire

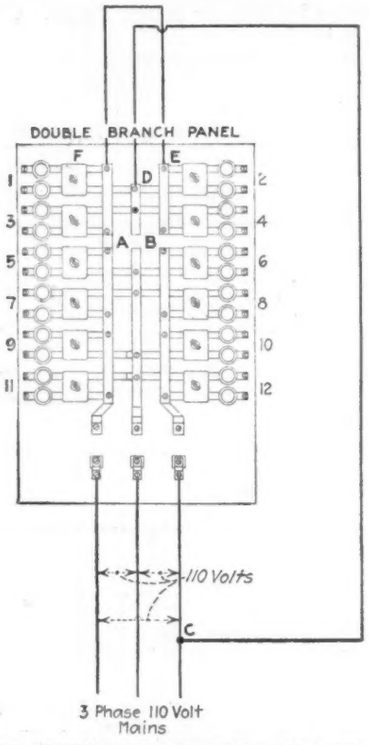
One of the largest utilities in the Mississippi Valley has discontinued the practice of insulating 4000-volt primary-pole connections with rubber hose. It was found that in about a year the rubber deteriorates and becomes so porous that the fabric absorbs moisture. The hose then gives no protection where some is expected and may become an unexpected source of danger to linemen. To overcome this hazard No. 6 stranded wire insulated with Kerite $\frac{5}{32}$ in. (4 mm.) thick and covered with a seine twine braid impregnated with Kerite compound will be used. This insulation is impervious to the weather, to acids and to gases. Wire insulated in this manner will be used for all 4000-volt primary pole connections, including vertical transformer risers and connections to primary pole switches, fuses, etc.

SINGLE-PHASE PANELS CHANGED TO THREE-PHASE

Inexpensive Way of Reconnecting Single-Phase, Three-Wire Lighting Panels for Balancing Load on Three-Phase, Three-Wire System

BY H. L. CORNELISON
Electrical Equipment Engineer, Austin Company, Cleveland, Ohio

It became necessary to place all electric lighting and power lines under ground when the business section of Jacksonville, Fla., became congested with overhead lines and poles. A balanced three-phase, 60-cycle system con-



SINGLE-PHASE, THREE-WIRE LIGHTING PANEL RECONNECTED TO GIVE BALANCED LOAD ON THREE-PHASE, THREE-WIRE SYSTEM

nected in closed delta had been used for power, and the incandescent lighting load in each building had been connected three-wire, 100/220-volt, single-phase. When the underground system was installed it was deemed advisable to supply three-phase, 110-volt energy to the 15-amp. or larger single-phase, three-wire lighting panels in each building as a balanced condition was desired throughout the system. The engineers were therefore confronted with the problem of working out the most economical method of changing the existing three-wire single-phase lighting panels for balanced three-phase operation without making the front of each panel unsightly.

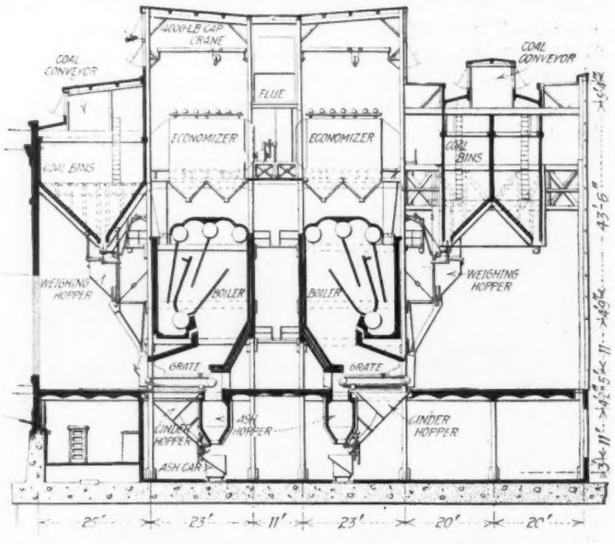
It was found that all of the panels could be most easily changed to operate on the three-phase system in a manner similar to that described for the twelve-circuit panel shown in the accompanying illustration. It will be noted that circuits Nos. 5, 7, 9 and 11 are already connected across phase No. 1 and that circuits Nos. 6, 8, 10 and 12 are connected across phase No. 2. To balance the system it is then only necessary to connect circuits Nos. 1, 2, 3 and 4 across phase No. 3. This was accomplished by cutting two of the buses at points *A* and *B* and connecting point *C* to point *D* with a jumper of the same capacity as the line. Point *F* was also connected to point *E*. The result was that the four top circuits were connected across phase No. 3, and it was only necessary to remove the cabinet door and trim the panel to accomplish this work. No special copper strips and no extra drilling were necessary. This made the change very inexpensive.

After all the panels had been changed to operate on three-phase in this manner it was found that the values of the secondary current were the same in each phase to within 10 amp. or 20 amp. under normal load conditions.

NEW BOILER SETTING

Development Made by Cleveland Company to Get Desired Gas Flow Puts Stoker Under Mud Drum

In that section of the Lake Shore station of the Cleveland (Ohio) Electric Illuminating Company known as the 1918 addition a new furnace design has been worked out. Its essential features are shown in cross-section on the drawing published here. The chain-grate stokers, instead of being placed in the usual way under the front of the boiler, are installed at the rear under the mud drum. An igniting arch extends under the mud drum, which sits rather high, its center line being 15 ft. 8 in. (4.8 m.) above the floor line. The boiler baffling is of the type known as "four-pass baffling." The gases, in passing through a boiler so arranged, enter the first bank of tubes at the top instead of the bottom. This puts the uptake also at the rear of the boiler and permits the gases that have passed through the two banks



STOKER SET UNDER MUD DRUM OF BOILER WITH FOUR-PASS BAFFLING

of economizers to be taken off in a single centrally located flue. The table gives further interesting data:

Type of boilers	Stirling, water tube, class M-25
Type of stokers	Green, chain-grate, type L
Boiler rating in square feet of heating surface	6,864
Size of stokers	13 ft. long by 12 ft. wide
Grate area in square feet	156
Ratio of grate area to heating surface	1 to 44
Content of furnace in cubic feet	3,000
Cubic feet of furnace, volume per square feet of grate area	19

From the data presented in the table it will be observed that the furnace volume is higher than in many older installations. This is thought to be in line with the modern tendency of boiler setting design.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

SAME COMPANY SELLS BOTH GAS AND ELECTRIC RANGES

Louisville Company Has Adopted Policy of Supplying Electric Cooking Service in the Territory Not Covered by Gas Mains

While the Louisville Gas & Electric Company sells high-grade natural gas for 35 cents per 1000 cu.ft. in the territory covered by the gas mains, it also sells electric ranges in the territory which these gas mains do not reach. In this territory there is a population of about 25,000 and there are about 1000 electric service customers. The company expects to place 160 ranges this year.

SOME METHODS FOR BETTERING METER-DEPARTMENT EFFICIENCY

Rules Relating to Height of Meters, Pass Keys, Filling Orders, Disconnection, Etc., as Brought Out at Meeting of Texas Employees

There came from the first efficiency meeting of the Texas Power & Light Company, held at Paris, a number of details relating to meter-department operation, some of which are set down here.

Meters, it was decided, should be set not higher than 6½ ft. from the floor. Higher than this they cannot be considered accessible to the meter reader or the meterman in case a test is required. The company will move meters down lower on the wall without charge if the customer will pay for the wiring.

A pass key must never be used for any place where there is furniture, with the exception of lodges, churches and picture shows.

In signing orders of any kind the employee doing so is to use his last name and never the initials only.

Orders received in the morning should be filled in the afternoon; orders taken in the afternoon should be filled the next morning, and if taken before 4 o'clock may possibly be filled that afternoon if the case is urgent. No connect order will be taken after 4 o'clock with a promise of being filled before the next morning. The office should put the number of the meter on disconnect orders where there are several meters in the same house. Meters should be tagged in a house where there are several meters and a change is made.

It will be the work of the office force to do all in its power to get the customer to come to the office to sign an application, and the work of the service men to get meters set in accessible places not exposed to the weather.

If a disconnect notice is written for a house which is to be reoccupied within a week, the distribution department should get the reading and open the switch, but leave the meter in the house. If the house is not to be occupied for some time, the meter should be brought in so that it may be cleaned and tested. Where the meter is left in a vacated house the meter card should say, "Meter left in," and it should also show the work order number when the meter is removed. It is preferable to disconnect at the pole where the meter is to be left in a house, except in apartment houses.

It was decided to leave the reading on a disconnected meter as it stands, rather than run the meter back to zero. If the customer objects, it is then explained that the company has a record of the reading in the office and knows exactly where to begin using it.

SELLING ENERGY TO COAL MINES FOR MOTOR SERVICE

Characteristics of the Load Make It a Desirable One for Central Stations, and Changing Attitude of Mine Owners Makes Selling Easier

BY H. W. YOUNG
President Delta-Star Electric Company, Chicago

During the past two years there has been a great increase in the number of coal mines using power supplied by central stations. Some transmission companies have built generating stations to supply power exclusively to mines. Other central stations have materially increased their distribution systems in new mining districts. These extensions in connection with the low-cost outdoor substations make it possible to supply power economically for both small mines and large mines.

One example of this sort of central-station development which is especially interesting comes from a transmission company in the Middle West. This company serves twenty-one mines from thirteen outdoor 33,000-volt, three-phase, 60-cycle substations. The aggregate transformer rating of these stations is 5375 kw. In addition to this coal-mining load, the same generating station also has connected load aggregating approximately 1800 kw., coming from eight small towns which the company serves.

During the month of March, 1918, the demand from the mining load totaled 2239 kw. and the energy sold to the mines amounted to 184,185 kw.-hr. These data show that the mining load alone operated at a demand factor of 41 per cent and a monthly load factor of 11 per cent. During the same month the average number of mine working days was twenty. The system peak for the month was 4258 kw., the diversity between the mining and other loads being favorable. The characteristics of the minng load from a central-staton standpoint are further improved, because there is a more or less constant demand for power regardless of the coal production of a mine. While a mine may be closed as far as mining or hoisting is concerned, pumps, fans

and small power devices are continually operated every day and at every hour of the day.

Central stations in many instances have not fully developed the coal-mining load, feeling that it was often a hard problem to convince the mine operator that power could be purchased at less cost than it could be generated for at the mine. At old mines having their own plant the central-station opportunity will come when it is found necessary to expand and enlarge the capacity. This is a good place to put in a motor-generator, running it in parallel with the coal-mine plant. The mine owner will quickly see that with this auxiliary central-station power he can shut down his generating plant on days when he is not mining coal. Other savings can be effected by banking fires and laying off all labor during the night shift. In one case a steam hoist was changed over by putting a gear wheel on the sheaves and gearing to a motor. By starting sales operations in this way the old mines can be gradually won over and will eventually take more power or all of it from the transmission lines. In many cases the possibility can be pointed out of further development than would have been considered if the mine owner had to enlarge or rebuild the steam plant.

Very little trouble will be experienced by the central station in selling power to the new mine, as coal operators now realize that isolated plants cost money, that depreciation costs run into considerable figures, and that by securing energy through the substation their power problems can be transferred to the organization best equipped to handle them. In a new district opened recently the transmission company is supplying power to a mine which expects to get out 6500 tons of coal per day. The 600-hp. direct-connected hoist at this mine receives energy through a synchronous motor-generator set. All energy is sold on a demand basis using the average of the highest three fifteen-minute integrated peaks each month. Other mines are being opened in this district and power will be supplied through outdoor substations.

PROFITS FOR CONSUMERS IN LARGE POWER CONTRACTS

War-Time Costs Gave Substantial Asset Value to Contracts Made Under Pre-War Conditions—Policy for the Future

Many companies have had striking instances of the value of power contracts to large industrial consumers under the high cost conditions which developed unexpectedly as a result of war shortage and demand. Such contracts, based on the pre-war status of operating cost, became assets of real value to consumers. Advance in the cost of fuel alone made a radical difference to the consumer. In addition to the financial advantage offered by a contract of this character, the general consumer was more likely to be protected in his power supply than if he tried to provide it himself. His contract with a central station relieved him of both labor and coal difficulties. The acuteness of both of these difficulties is thoroughly appreciated and needs no other emphasis than simple mention.

As bearing on the worth of power contracts made at a period antedating the war costs a report by the receiver of a manufacturing company may be cited. In this case a special master in chancery, reporting to the court, said that "the rates and service provided for in the contracts as written and in force at the time of filing this application are more favorable than could be obtained under present conditions and should be an asset of value" to the patron of the central-station company. Another case may be mentioned where an industrial consumer, ill advised for its own welfare, canceled a power contract with a central-station company at the height of the war-time demand under the impression that it could replace the equivalent service of power without extra expense. The outcome was that the contract, which had been made originally under conditions particularly favorable for the consumer, was renewed but at a rate several times the figure stated in the original document.

It is not the function of central stations to make contracts for power with consumers which, by reason of abnormal changes in operating cost, become great assets or great liabilities to either of the two contracting parties. By the chance of war it has happened that many consumers have benefited substantially from economic changes that could not well have been foreseen. By checks and safeguards, by coal clauses, by continued study of the factors which make up operating cost, the tendency in future will be to keep contracts for large blocks of electrical energy close to a basis of cost plus profit.

This policy will be in accord with the spirit of fair play as between different classes of consumers and with the laws and the rulings of regulating commissions.

PLACE OF ELECTRICITY IN THE AUTOMOBILE "TRAILS"

Use of Energy in Lighting and Building These Well-Advertised Highways of Pleasure and Commerce Offers Possibilities

Automobile "trails" attract much attention and are thoroughly advertised. The use of electrical energy in lighting them as well as in construction presents possibilities which up to the present have not been thoroughly developed.

W. F. Raber, vice-president and general manager of the Arkansas Valley Railway, Light & Power Company, Pueblo, Ark., claims credit for his company as the first to supply electricity to be used exclusively in road building. The Pueblo *Chieftain* of April 13 contained a long article concerning the work which is being done on the Santa Fé trail. The following paragraphs from the article serve to emphasize the part played by electricity in the connection under notice:

Electricity is now playing a very active part in road construction in Pueblo County. In addition to the motorized vehicles for hauling road-building materials and the motorized machinery for grading and surfacing the roads, electricity is being used to drive the stationary machinery which prepares the materials for the road foundations and the surface. Perhaps no other county in the state is quite so favored with a combination of gravel, stone and electric service as is Pueblo County. Especially is this the case between Pueblo and Fowler, where gravel beds abound every few miles, rock is within easy haul and the high-tension electric wires of the Arkansas Valley Railway, Light & Power Company follow along the Santa Fé trail down the valley.

This electric energy is being utilized in building this Santa Fé trail into a highway boulevard from Pueblo to Fowler, or to the East Pueblo county line.

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Commissioning Alternators.—C. W. MARSHALL.—Drying-out, pressure tests, phase sequence, synchroscope connections, phase rotation and subsidiary tests are discussed in this article.—London *Electrical Review*, March 21, 1919.

Maximum Power of Electrical Machines for Given Temperature Limits.—H. LAJUS.—The title gives the object of this theoretical study, which the author holds can have a practical application in conducting the tests of a continuous-current machine, alternator or transformer.—*Revue Générale de l'Electricité*, March 29, 1919.

A 60,000-kw. Transformer.—A static transformer of this capacity has been supplied by the A. E. G. company in Berlin to a Rhineland central station. The pressure is stepped up to 110,000 volts from 6250 volts primary. The complete transformer weighs 116 tons, of which the core accounts for 66 tons, the casing for 15 tons and the insulating coils for 35 tons. The over-all height is 17 ft. 3 in. (5.8 m.) and the floor space occupied is 18 ft. by 18 ft. 4 in. (5.48 m. by 5.58 m.). The four low-tension coils for 6250 volts are normally connected in parallel but may be placed in series to work with a primary tension of 25,000 volts. The transformer is insulated with a material specially manufactured by the A. E. C. company for high-tension purposes. The oil is cooled while circulated within the transformer casing, and a coil is immersed in a water tank by a pump which delivers 495 gal. (1873 l.) of oil per hour and is kept under a higher pressure than the water to prevent any leakage of water being absorbed, as this would damage the insulation. Tests showed a loss of 126 kw. in the iron core and 434 kw. by radiation from the aluminum coil—that is, a total loss of 560 kw. —which corresponds to an over-all efficiency of 99.07 per cent.—*Technical Supplement to Review of Foreign Press.* (Abstracted from *Zeitschrift des Vereines Deutscher Ingenieure*, Feb. 1, 1919.)

Lamps and Lighting

Some Special Problems in the Lighting of Laboratories and Technical Institutions.—At a technical or engineering college the lighting should be done scientifically if the student is to get fundamental ideas of illumination. Lecture theaters, chemical laboratories, electrical and physical laboratories are discussed in regard to lighting.—London *Illuminating Engineer*, January, 1919.

Modern Practice in Office Lighting.—A. WISE.—Choice of methods of lighting and applications to various types of offices are discussed, and typical examples of installations are given. The importance of periodically cleansing lamps and lighting units is also shown. Charts showing the reduction in light due to the accumulation of dust on the several kinds of units described are then produced.—London *Illuminating Engineer*, February, 1919.

Generation, Transmission and Distribution

Calculation and Design of Direct-Current Circuits.—TERRELL CROFT.—A discussion of the elementary calculations for electric light and power circuits plentifully illustrated with diagrams and typical examples.—*National Engineer*, March, 1919.

Transforming Direct Current Into Alternating, or Vice Versa, Without Commutators.—O. LI GOTTI.—The author explains a new method which makes this transformation possible by producing variations of flux with the aid of an apparatus that varies the reactance and obviates the need of the commutators hitherto employed. —*Revue Générale de l'Electricité*, March 29, 1919.

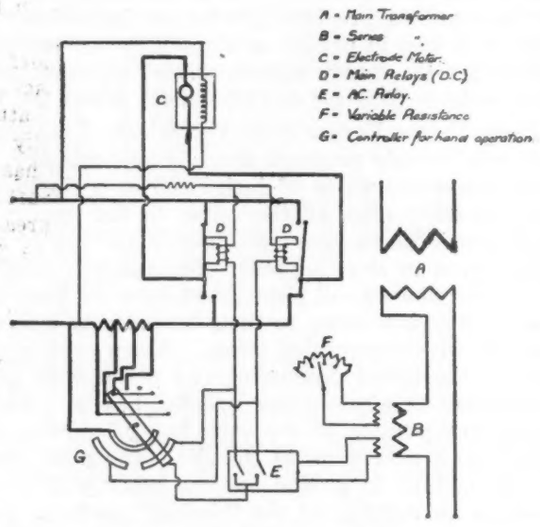
Utilizing the Power of the Tides.—R. GOUEDARD.—As a result of his researches into the feasibility of using the waste power of the tides for the manufacture of energy, the author indorses the favorable conclusions of M. Maynard in previous articles on the subject and joins with him in urging on capitalists and the public authorities the speedy undertaking of an experimental plant.—*Revue Générale de l'Electricité*, March 29, 1919.

Plate Valves Versus Stop Valves.—E. CLAASSEN.—The considerable pressure drop in an ordinary stop valve represents waste of fuel, small at a single valve but important when all the valves in the country are considered. The author recommends the use of plate valves, even in ships or other comparatively small installations where small plate valves have not been much used in the past owing to their tendency to leak, particularly with superheated steam. A new type of plate valve is illustrated comprising two plates with an intermediate keypiece. The spindle has an internal thread, the position of the valve being indicated by a wheel worm geared to the spindle. The plate closing the steam inlet is ground but the other plate is not. There is no rubbing of the "closing" surfaces, and a "warming valve" is provided to bypass steam and, by warming the body of the valve, prevent jamming due to differences in thermal expansion.—*Science Abstracts*, February, 1919. (Abstracted from *Zeits. V. D. I.*, Nov. 2, 1918.)

Use of Electricity in Agriculture in Germany.—In a paper read before the Royal Society of Arts Dr. J. F. Crowley discussed this subject. He said that the mistrust of the farmer had almost completely disappeared in Germany before the war. Cheap production of electric power in central stations and its transmission to various parts of the country gave the German farmer an opportunity of advantageously introducing electricity into his farmyard, field and buildings. The three-phase system was almost invariably adopted, as it permitted the use of squirrel-cage motors, which were ideal for agricultural work. Particulars are given of the lamps, fittings, wiring, etc., used for lighting installations, and

a calculation is made of the cost of electricity compared with other forms of lighting. Before the war the cost of energy for lighting in rural districts was 40 pfennigs per unit, and 0.2 pfennig was sufficient to add to cover the cost of the metal-filament lamp. In the case of a farm of about 92 acres eleven incandescent lamps were installed in the dwelling house and eleven in the working places. The cost of the lighting plant, apart from the power plant, was 390 marks, and the energy consumption during one year for lighting was 77 kw.-hr., which at 40 pfennigs came to 70.80 marks. (The pre-war value of a pfennig was about ¼ cent and of a mark approximately 25 cents.)—London *Electrician*, Feb. 28, 1919.

Control of Electric Furnaces.—FRANK E. HILL and A. P. M. FLEMING.—In this article attention is paid only to those properties which are supplied from an alternating-current source, the power usually being available at a voltage which must be transformed before it can be applied directly to the furnace. Under "Methods of Control," variation of voltage and variation of current are discussed and the methods of variation of voltage are outlined. These methods are alteration of the ratio of the main transformer by tappings, alteration of the ratio of the main transformer by an auxiliary winding, use of a primary booster transformer, use of a secondary transformer and control of a motor-generator. Under "Current Control," hand-



ELECTRODES RAISED OR LOWERED BY MEANS OF SHUNT-WOUND MOTOR

operated movement of electrodes, movement of electrodes by electrical or hydraulic power under manual control and automatically controlled motors are discussed. The control by current regulation is accomplished by raising or lowering the electrodes, thus varying the input to the furnace. This method may be used in place of or as an auxiliary to one of the beforementioned methods of voltage control. Regulation by moving the electrodes is employed principally in the case of furnaces used for steel smelting, although there are a considerable number of examples of this type of control equipment employed in furnaces used for the production of calcium carbide, abrasives, etc. In the case of small furnaces the raising and lowering of electrodes may be performed by a hand-operated winch, but in large furnaces it is usual for this to be done either by hydraulic power or automatically by means of an electric motor operating through hauling mechanism. In the accompanying illustration a regulator of the relay type shows the general arrangement of the machine or Routin regulator. The electrode is raised or lowered by means of a shunt-wound motor operating through suitable gearing. The armature of the motor is connected in series with two main interlocked relays which control the direction of current through the armature according to whichever relay is in operation. The main relays are excited from a third relay, which is operated through a series transformer inserted in the secondary circuit of the main transformer supplying the service. This relay is in a neutral position when the current supplied to the furnace is at a predetermined value, but when the current increases or diminishes it comes into operation and excites the appropriate main relay. In order to set the relay to respond to a predetermining value of the furnace current the series transformer has an auxiliary secondary winding which is short-circuited through a variable resistance.—*Transactions* of the Faraday Society, January, 1919.

Installations, Systems and Appliances

Electrical Welding; Its Theory, Practice, Application and Economics.—H. S. MARQUAND.—In this, the introductory article of a series, the author gives a general survey of welding and refers briefly to soft soldering, brazing, thermit welding, riveting, blowpipe welding and electric welding.—London *Electrician*, March 21, 1919.

Electrostatic Precipitation.—O. H. ESCHOLZ.—A diagram of the precipitator or treater circuit for this system is given, together with a list of apparatus used. The two main systems and other minor systems used in the process are described, with the advantages and disadvantages of each. Transformation, rectification, suppression of treater short circuits, treater voltage, operating voltage, electrode vibration and treater problems are discussed in full. The commercialization of the electrostatic precipitation process has pivoted about the development of transformers. The synchronous contact maker or mechanical rectifier, besides converting high-tension alternating current to high-tension direct current, serves to (a) suppress treater short-circuits and (b) sustain treater voltage, thereby permitting operation within a few per cent of the critical voltage of the treater, while also maintaining a practically constant voltage, resulting in high recovery of suspended substances.—Paper presented before the Colorado Meeting of the American Institute of Mining Engineers, September, 1918.

Electrode Manufacture.—The demand for special steel which followed the outbreak of the war resulted in a large addition to the number of electric furnaces in operation in Great Britain. The shortage of electrodes made it necessary to develop processes for their manufacture in that country. It is said that most of the carbon electrodes are cheaper than graphite electrodes, although the amorphous carbon electrodes cost now more than $200 per ton. Although the electrode consumption of modern steel furnaces is usually given as about 10 lb. (4.5 kg.) per ton of steel, the average consumption including breakages is well over double that figure. It is said that the manufacture of amorphous carbon electrodes has presented some difficulties. The work calls for uniform temperature varying from 450

deg. to 600 deg., but it is possible to meet these requirements of temperature by the use of gaseous fuel. The writer describes a furnace for the manufacture of carbon electrodes 20 in. (51 cm.) in diameter, the output of which exceeds 30,000 tons of steel per annum. Details of the gas and air supply follow.—*Electrical Times*, Feb. 27, 1919.

Electricity in Household Service; the Central Station.—H. C. HOYT.—In undertaking a discussion of the relation of the central station to electric service in households, the writer gives an idea of the growth in central-station systems. It has been estimated that fully 70 per cent of the population of the country is in some way affected by the use of electrical energy. The following table gives some idea of the extraordinary growth of these electrical systems in the fifteen years extending from 1902 to 1917:

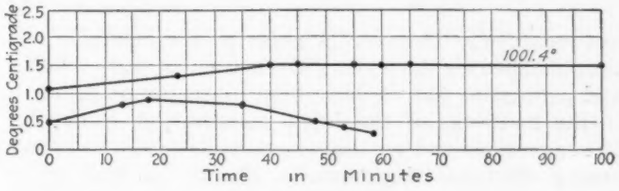
	1902	1907	1912	1917
Total number central stations....	3,620	4,714	5,221	5,500
Investment in construction and equipment.....	$504,740,000	$1,096,914,000	$2,175,678,000	$3,000,000,000
Total number of employees.....	30,326	47,632	79,335	125,000
Total gross income	$85,701,000	$175,642,000	$302,116,000	$550,000,000
Total income from electric service..	$84,187,000	$169,615,000	$286,981,000	$500,000,000
Total generator capacity in kilowatts.....	1,212,000	2,709,000	5,135,000	9,000,000
Total kilowatt-hour output....	2,507,051,000	5,862,276,000	11,532,963,000	28,000,000,000

—*General Electric Review*, March, 1919.

Electrochemistry and Batteries

Melting Points of Chemical Elements and Other Standard Temperatures.—Centigrade and Fahrenheit melting points for the chemical elements are given in tables.—*Bureau of Standards Circular No. 35* (third edition), July 15, 1918.

Temperature Uniformity in an Electric Furnace.—JOHN B. FERGUSON.—The problem of obtaining uniform temperature in an electric furnace used for investigational work at high temperatures is one of importance. The writer describes designs of furnaces giving uniform temperature from end to end over ranges of 620 to 1190



TEMPERATURE CONSTANCY

The upper curve shows the fluctuations in the furnace temperature with time in part of a four-and-a-half-hour run with a furnace at 1001.4 deg. The lower curve shows the fluctuations in the furnace temperature with time in a run with a furnace at approximately 1190° deg.

deg. In addition to the heating coils in the end plugs there are three independent heaters which are used to control the temperature. The use of alternate layers of insulating and conducting materials not only reduces the total amount of insulation necessary but eliminates the effect of temperature fluctuations due to the surrounding air.—*Chemical and Metallurgical Engineering*, March 15, 1919.

Pocket Battery Lamps.—H. LUX.—A description is given of the methods of manufacturing pocket battery lamps in Germany during the war, with particular reference to the difficulties presented by lack of the raw materials required. The success that was attained is due to the drawing up of standardizing regulations and the introduction of reliable methods of testing the internal electromotive force, internal resistance, depolarization, capacity and powers of withstanding deterioration during storage.—*Technical Supplement to Review of Foreign Press.* (Abstracted from *Elektrot. Zeits.*, Jan. 9, 1919.)

The Future of Electrolytic Chlorine.—A. H. HOOPER.—Discussion of the development of the electrolytic chlorine industry and its bearing on the future of the millitary defensive policy of the United States.—Paper presented before Oct. 1, 1918, meeting of the Electrochemical Society.

Telegraphy, Telephony and Signaling

Improvements in Multiple Telegraphy.—This paper describes three methods of multiple telegraphy based on the employment of Hughes apparatus. In the first arrangement division of line time and the duplex balance are used to get two independent channels in each direction (double duplex). By a system of bevel gears the chariots of two Hughes instruments are coupled to a common axis carrying the speed regulator and a rotating crown-wheel commutator. The line is alternately connected to the two transmitting levers through the medium of the commutator, and one lever is arranged to send positive, the other negative, impulses to line when it is operated. The signals are received on two polarized relays oppositely connected so that one responds to positive and the other to negative currents only. This system is stated to have worked satisfactorily on a 5-mm. iron wire 400 km. in length, using a battery of 220 volts. The second system is substantially the same as the first. Each transmitting apparatus has its own commutator, which is coupled to the main shaft for one revolution when a transmitting key is depressed. Signal impulses are twice as long as those of the first plan, and it has been found possible to work over distances of 500 km. to 600 km. The third arrangement depends upon synchronously run distributers between the two terminals. One of the distributers is arranged to be held against making a second revolution until a releasing current is sent from the distant station. The release current is automatically sent once per revolution, and if the receiving distributer is run slightly faster it will be positively held at the end of one revolution and start the next revolution correctly in phase.—*Science Abstracts*, Section B, February, 1919. (Abstracted from *Elektrot. u. Maschinenbau*, Dec. 1, 1918.)

Miscellaneous

Electrical Vehicle Progress in New Zealand.—Rapid advances have been made in the use of electric vehicles for city service and other purposes in New Zealand. Particulars are given of the economical use of electric wagons by a coöperative dairy company.—*Electric Vehicle*, December, 1918.

Storage of Coal and Spontaneous Combustion.—S. H. PUDNEY.—As a result of many years' practical experience, the writer attributes most cases of spontaneous combustion to the presence of sulphur in scale and bone coal, and he advocates proper ventilation for the prevention of these fires.—Paper read before the Canadian Railway Club, February, 1919.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

EDISON MEDAL AWARDED TO BENJAMIN G. LAMME

Presentation of Trophy and Exhibition of Weaver Memorial Tablet Will Take Place in New York on May 16

The annual business meeting of the American Institute of Electrical Engineers will be held on Friday, May 16, in the auditorium of the Engineering Societies Building, New York, at 8:30 p.m. The board of directors will make its annual report, including a financial statement for the year ended April 30, 1919. The report of the tellers will also be presented, giving the results of the election of officers for the ensuing administrative year.

Weaver Memorial Tablet to Be Exhibited

The Weaver memorial tablet, which is to be erected in the headquarters of the Institute "in acknowledgment of the services rendered to the Institute and to the electrical engineering profession by William D. Weaver," will be exhibited at this meeting.

Immediately following the business meeting will take place the ceremony of the presentation of the Edison medal. This medal was founded by the Edison Medal Association, composed of associates and friends of Thomas A. Edison, and is awarded annually by the Institute "for meritorious achievement in electrical science, electrical engineering or the electric arts."

The Edison medal has been awarded this year to Benjamin G. Lamme "for invention and development of electrical machinery," and the presentation ceremonies will be as follows:

1. "The Edison Medal," by Carl Hering, chairman Edison medal committee.
2. "Achievements of Benjamin G. Lamme," by B. A. Behrend.
3. Presentation of the medal, by William B. Jackson, vice-president A. I. E. E.
4. Response, by Benjamin G. Lamme.

Non-members of the Institute are cordially invited to attend this meeting. Ladies are welcome.

Professional Activities of Mr. Lamme

Benjamin G. Lamme was born in Springfield, Ohio, in 1864 and was graduated from the Ohio State University as a mechanical engineer in 1888. The subjects in which he is particularly interested are analytical, such as mathematical and mechanical problems.

He entered the testing department of the Westinghouse Electric & Manufacturing Company on May 1, 1889. The company was then engaged almost exclusively in the manufacture of high-frequency alternating apparatus for incandescent lighting. The development of practically all types of polyphase alternating-current apparatus and railway generators and motors was a matter of the future in which Mr. Lamme took a leading part. He has invented and designed much of the apparatus and many of the systems and methods which are now in general use. He has about 140 patents, many of which are of fundamental importance and cover inventions which have contributed very largely to the present methods of generating, transmitting and using electrical power.

In 1900 he was made assistant chief engineer and since 1903 he has been chief engineer of the company. Aside from his personal engineering activities, he acts in an advisory capacity to the whole engineering interests of the company. He is chairman of the company's committee which passes upon new inventions and appliances.

Mr. Lamme is the author of many technical papers presented before engineering societies, some of which

B. G. LAMME

are regarded as classics. A paper on the induction motor published eighteen years ago is used in many schools, and permission has recently been given for including it in the textbooks of the Naval Academy at Annapolis. His inventions and writings have made him well known among electrical engineers in Europe as well as in America.

Mr. Lamme has been an acknowledged leader during the past twenty-five years in the engineering work of the Westinghouse company, and many advances in the general use of electricity are due to his ingenuity and ability and discriminating judgment in directing and passing upon the engineering work performed by others.

In 1915 Mr. Lamme was, upon nomination by the American Institute of Electrical Engineers, appointed by the Secretary of the Navy to membership on the Naval Consulting Board, and his services as a member of the board during the war have been of great value to the country.

NOMINEES FOR OFFICE IN THE A. I. E. E., 1919-20

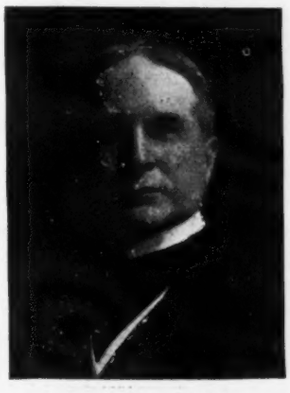
Calvert Townley Named for President in the Ensuing Institute Year— Other Nominees on the Official Ballot

The nominees for officers of the American Institute of Electrical Engineers for the ensuing year are as follows:

For president—*Calvert Townley, New York; †J. Franklin Stevens, Philadelphia.

For vice-presidents (six to be elected)—*C. E. Skinner, East Pittsburgh; *John B. Fisken, Spokane, Wash.; *N. A. Carle, Newark, N. J.; J. B. Whitehead, Baltimore; *L. R. Jorgensen, San Francisco; *Wills Maclachlan, Toronto; *A. M. Schoen, Atlanta.

For managers—*L. E. Imlay, Niagara Falls, N. Y.; L. F. Morehouse, New York; F. F. Fowle, Chicago.



CALVERT TOWNLEY

For treasurer—George A. Hamilton, Elizabeth, N. J.

The ballots have been cast in accordance with the constitution, and the result of the election of officers will be announced at the annual business meeting of the Institute to be held in New York on May 16.

Calvert Townley, whose election as president of the Institute for the ensuing year is assured, is assistant to the president of the Westinghouse Electric & Manufacturing Company. He served as an active official of the New York, New Haven & Hartford Railroad in connection with the electrification of the New York terminal zone of that property and is an accepted authority on railroad electrification.

*Directors' nominees.
†Candidate requested, prior to nomination, that his name be withdrawn.

PROGRESS MADE IN A. I. E. E. DEVELOPMENT COMMITTEE WORK

At Meeting of the Executive Committee Many Suggestions from All Parts of the Country Are Compiled for Report to General Committee

A meeting of the executive committee of the development committee of the American Institute of Electrical Engineers was held in New York on May 2. Progress was made in the work of preparation for the report, which it is expected will be submitted at the annual Institute meeting at Lake Placid, N. Y., June 24.

The executive committee of the development committee will resubmit to the members of the development committee throughout the country a compilation of the information and suggestions received. A large number of suggestions from all parts of the country were before the executive committee at the meeting last week. The main features of these suggestions were compiled in the form in which they were to be resubmitted to the members of the general committee. It was stated that the compilation of the suggestions, presenting rather the broad policies under consideration than the details of methods proposed, was to be sent during the current week to members of the general committee.

Members of the executive committee said that they did not feel at liberty to give publicity to the results of the correspondence, but that the executive committee will meet again in June to receive the additional comments which are expected from all sections. The membership at large is taking great interest in the matter, and the suggestions made are being sent to the general committee in the letter, which is in the form of a report by the executive committee.

ONE-MAN SUBSTITUTE FOR NEW YORK CITY COMMISSION

Lewis Nixon Made Regulatory Public Service Commissioner in New York City Under New State Law, Superseding Larger Body

Under legislation enacted by the last Legislature the New York Public Service Commission, First District, is superseded by one or two single-headed commissions. Separate bills were passed providing for, respectively, a regulatory Public Service Commissioner and a construction Public Service Commissioner. The bill providing for the regulatory commissioner has been signed by Governor Smith, who on May 3 appointed Lewis Nixon to the office which it created. Col. William Barclay Parsons is said to have declined the office of construction Public Service Commissioner.

By the appointment of Mr. Nixon, a Democrat, three remaining members of the old commission, Republicans, are legislated out of office. They are Travis H. Whitney, F. J. H. Kracke and Charles S. Hervey. Mr. Whitney announced that he will be associated with W. J. Norton and associates, for whom he will act as counsel.

Mr. Nixon has been State Superintendent of Public Works since Jan. 1. He was the leader of Tammany for a short time and had held many public offices. He was born in Leesburg, Va., in 1861, and was graduated as a naval cadet at Annapolis in 1882. He designed the battleships Oregon, Indiana and Massachusetts and established the Crescent Shipyards at Elizabeth, N. J.

The salary of the regulatory commissioner is $15,000 a year. Under the law three deputies are to be appointed at $7,500 a year each.

Travis H. Whitney, in speaking of the work of the superseded commission, said in part:

The relationship between the utility companies and the public has been recognized and improved. The public has the advantage of greatly increased facilities and of lower electric rates to the extent of several million dollars yearly.

It may be that rates and service were pushed too far in favor of the public, particularly with the war conditions, and it may be the pendulum will need to swing back. At any rate the public evidently desired a change in the administration of public service matters.

JUDGES ANNOUNCED FOR N. E. L. A. PRIZE CONTEST

E. W. Lloyd, Paul Spencer and C. J. Russell Selected to Make Awards of Victory Liberty Bonds for Articles on Exhibi s

In a letter to exhibitors at the annual meeting of the National Electric Light Association at Atlantic City, beginning on May 19, J. W. Perry, chairman of the exhibition committee, announces the selection of judges for the prize contest which is to be a feature of the convention. The men chosen to pass on the papers are E. W. Lloyd of the Commonwealth Edison Company, Chicago; Paul Spencer, United Gas Improvement Company, Philadelphia, and C. J. Russell, Philadelphia Electric Company.

Mr. Perry emphasizes the importance of the prize contest as a means of stimulating interest in the exhibits. The delegates will have more than the usual incentive to study the exhibits carefully, as they will have to be thoroughly familiar with them in order to take part in the contest. This, he feels, should stimulate exhibitors to put forth their best efforts since they will be assured of the interested attention of the delegates. The contest will bring the Class B members of the association into closer touch than ever with exhibitors and will give the latter an unequaled opportunity to tell their story to an appreciative audience. The contest is open only to Class B members, but advertising and publicity men are barred from participation.

Mr. Perry suggests in his letter that exhibitors impress upon their convention representatives the necessity of being "on the job" at all times when the convention is open, since those taking part in the contest will doubtless choose the hours when there are few visitors on the floor, say, early in the day.

As stated in the ELECTRICAL WORLD of April 19, prizes for the best articles giving the impressions of delegates on the exhibition as a whole are to be awarded as follows: First prize, $150 in Victory Liberty bonds; second prize, $100 in Victory Liberty bonds; third prize, $50 in Victory Liberty bonds.

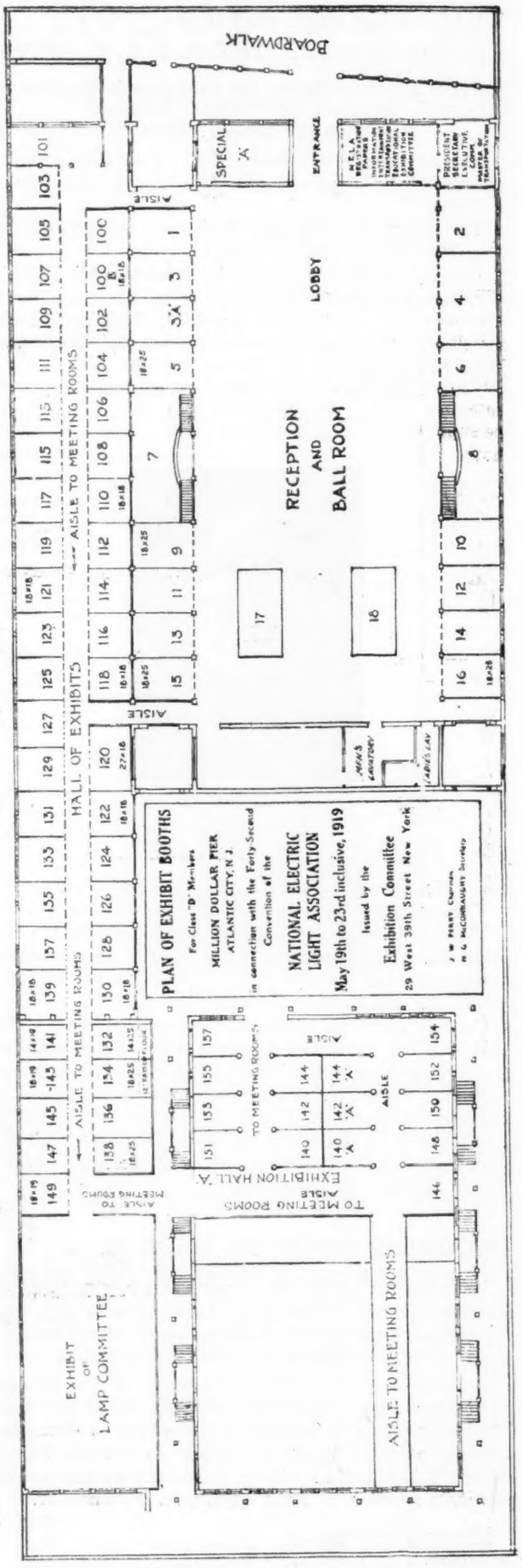
N. E. L. A. EXHIBITS AS SEEN BY EXHIBITION COMMITTEE

More Exhibition Space Could Be Used After Addition to the Original Allotment—Lighting and Transformation of the Scene

From the point of view of the exhibition committee of the National Electric Light Association the exhibits at the Atlantic City Convention beginning on May 19 will offer the following advantages to delegates:

Five acres of combination ballroom, hotel lobby, dance saloon and exhibition hall, all under one roof—same to be moored off the Atlantic Coast, within easy reach of land.

It should here be written into this program, as of historic interest, that this convention occupies the largest home in the history of the association, and more remarkable is the fact that with all its size it could still use more exhibition space, even after the addition of 3000 square feet to the original 20,000 square feet allotted it. Despite this addition, it was impossible to accommodate all applicants. "All under one roof" has always been the spirit of N. E. L. A. conventions, no matter what the actual geography of the respective convening places has been. This year your convention is literally "all under one roof" and to the convenience and pleasure of all.



The great ballroom is flanked with pergolas as a foreground *pia vista* of Italian gardens, which in turn are the setting in which exhibitors will display their interesting and diversified products. Then there are more garden paths flanked by more exhibits along the way that leads from the exhibition hall to the meeting auditorium.

This is an electric lighting convention, so logically lighting will play an important rôle—not only the workaday science, service, selling side, which will be shown in abundance, but lighting in mask and wig, lighting with the make-up on—playing to your eye and to your sense of the beautiful. Lighting at this convention will count you not only as a craftsman in electricity but also as a lover of the beautiful and of the artistic.

Lighting will entertain you. The great hall itself, through lighting, will appear in new guise day after day and night after night, for your entertainment and pleasure.

The ballroom will hardly be recognizable as between morning, afternoon and evening—what with its complete change in dress-up for business convention, exhibition hall, tea room, theater and finally dance saloon.

So that in the same expanse where in the morning you browse around among the exhibits that are so important from your business point of view you will in the afternoon be entertained in a seemingly different place. You will be refreshed at a tea table and dance or laugh three hours later on the same spot where that table stood.

All under one roof—for the N. E. L. A.—for business, fellowship and pleasure. This you will agree is the thought that the exhibit hall will leave with you as a "souvenir" of the 1919 convention.

VARIED ENTERTAINMENT AT N. E. L. A. CONVENTION

T. I. Jones Announces Some Details of the Revised Program—Grand Carnival for Wednesday —Aeronautical and Wireless Exhibits

Final arrangements for the entertainment at the Atlantic City convention of the National Electric Light Association are being made by T. I. Jones, Brooklyn Edison Company, chairman of the entertainment committee. The program will begin Monday, May 19, at 10 a.m., with the opening of the exhibitions under the auspices of the Class D members. The reception of the president will come at 9.30 p.m. in the ballroom of the Million-Dollar Pier, the receiving line being stationed at the east end of the room. Dancing will follow the reception.

On Tuesday from 12.30 to 1.30 p.m. and from 4 to 5 p. m. there will be a demonstration of wireless telephony between the end of the Steel Pier and an airplane exhibit. A tea and musicale for the ladies will take up the hours from 4 p.m. to 6 p.m. In the evening comes the public policy session, followed by dancing, open to all the guests of the convention.

Wednesday morning and afternoon will be given over to a second exhibition of wireless telephony and to a display of aëronautical skill.

The feature of Wednesday's program is to be a grand carnival and ball in which effects of music, light and color, rather than fancy dress, are to be stressed. The carnival will begin promptly at 9.30 p.m. and will continue until 10.45 p.m., when there will be an illumination and dance spectacle. Lights of seventeen colors will be used. Bassett Jones will supervise the staging and scenario.

The entertainment committee will have headquarters on the ground floor of the Million-Dollar Pier, where H. S. Giellerup will be in charge. Delegates should wear their badges to participate in the privileges of the convention.

LAMP COMMITTEE HEAD EMPHASIZES THE EXHIBIT

Frank W. Smith Calls Display at Atlantic City of Specially Great Value—Make-up of the Committee

Frank W. Smith, chairman of the lamp committee of the National Electric Light Association, has issued a letter and leaflet in which he calls special attention to the committee's exhibit at the Atlantic City convention, beginning on May 19. Mr. Smith says:

"This exhibit will present a working machine shop, a life-size shop window and a home interior, equipped with numerous systems of illumination for demonstration and comparative test. There will be a great deal of practical value in it."

The members of the lamp committee are: Frank W. Smith, chairman; Douglas Burnett, Walter Cary, E. R. Davenport, W. W. Freeman, W. H. Johnson, G. F. Morrison, J. T. Mountain, J. P. McSweeney and F. S. Terry.

The sub-committees are composed as follows:

Standardization of Voltage—F. S. Terry, chairman; S. E. Doane, A. H. Moore, C. Renshaw, H. B. Rogers and W. H. Rolinson.

Standardization of Colored Lamps—W. A. Durgin, chairman; Louis Bell, Robert Ely, C. L. Law and P. S. Millar.

Exhibit—S. E. Doane, chairman; P. S. Millar, H. B. Rogers, W. H. Rolinson, L. C. Kent and R. B. Grove.

Lighting Sales Bureau—C. L. Law, chairman; O. R. Hogue, C. G. Durfee, E. A. Mills, W. A. Durgin, G. Bertram Regar, H. H. Magdsick, C. W. Johnson and Ward Harrison.

Portrait of Mr. Doherty

A portrait of Henry L. Doherty has been presented to the organization in New York on behalf of all the members by a committee of several of the leading officials. It was presented as a tribute of respect to the head of the organization. The portrait will be in the New York general offices. It was painted by Joannes de Taby.

CONFERENCE CLUB PLANS AGREEMENT WITH LABOR

Assistant Secretary of Labor and Acting President of International Brotherhood of Electrical Workers Take Active Part in Meeting

A national labor agreement formed the chief topic of discussion at the meeting of the Conference Club at White Sulphur Springs, W. Va., May 1, 2 and 3. The advantages of coöperating with organized labor had already been discussed at a previous meeting held in Pittsburgh last November, at which time it was agreed that no question could arise between employer and employee which could not be successfully settled at a conference table by the application of common sense and honest intentions. A joint meeting of representatives of the Conference Club and the International Brotherhood of Electrical Workers was provided for at that time, and as a result of the work of the committee a declaration of purpose by the International Brotherhood of Electrical Workers and the Conference Club was drawn up for submission to the club and for final action by the National Association of Electrical Contractors and Dealers and the International Brotherhood of Electrical Workers.

In the agreement it was pointed out that the vital interests of the public and of the employee and employer in industry are inseparably bound together. All will benefit by a continuously peaceful operation of industrial processes and the devotion of the means of production to the common good.

The declaration in substance embodies the following:

That each group in the industry should confine its efforts to developing its legitimate function to the end that controversy and wasteful competition resulting from the overlapping of function may be eliminated.

Close contact and mutually sympathetic interest between employee and employer will develop a better working system, stimulate production and improve relationships not only between employer and employee but between both and the community.

Strikes and lockouts being detrimental to the interests of all should be avoided.

A tribunal should be created with power to decide questions that might result in interruption of work, loss of wages and of capital and loss and inconvenience to the public.

Agreements or understandings which obstruct free trade development or grant special privileges are subversive of public interest, limit rights and opportunities, and should be condemned.

Public interest is conserved, hazards are reduced and standards of work are improved by fixing an adequate minimum of qualifications as a requirement to the right of any individual to engage in electrical construction work and by rigid inspection of such work.

Public welfare and interest of the trade demand that electrical work be done by the electrical industry.

Coöperation between employer and employee acquires constructive power as both become more completely organized.

The right of both employees and employers of local groups to establish wage scales and working rules is recognized.

In order that the above principles may be put into practice, it is necessary to create agencies for coöperation between the public and employees and employers. As a first step in that direction the agreement provides that the International Brotherhood of Electrical Workers and the National Association of Electrical Contractors and Dealers shall form a national executive council consisting of five representatives of each association. The council shall elect a chairman, a vice-chairman, a secretary and such officers as may be decided on and shall meet four times a year or more frequently as the need may arise. All meetings shall be open to the public. Rules for procedure and the necessary provisions for transaction of business shall be supplied by the council, and provision is made for the appointment of committees of ways and means, legislation, public information, industrial relations and such others as may be considered advantageous in promoting the objects of the declaration and the welfare of the public and the industry. A majority of the representatives of each organization shall constitute a quorum and the body may appoint one alternate to take the place of an absent representative. A permanent board of mediation or investigation, consisting of an equal number of representatives of employees and employers and of the public, will be created by the counoil, which will prescribe the rules of procedure.

James P. Noonan, acting president of the International Brotherhood of Electrical Workers, spoke of the desirability of such an agreement from the viewpoint of the employees, and L. K. Comstock and other members of the Conference Club spoke of the advantages which would accrue to the contracting industry if some such agreement were in existence. Mr. Noonan pledged his coöperation in getting the International Brotherhood of Electrical Workers to accept the agreement, stating that this would involve considerable time owing to the size of the brotherhood and to the necessity of getting action on the declaration especially by those particular branches of the brotherhood interested. The Conference Club will recommend the declaration of purpose to the National Association of Electrical Contractors and Dealers for action at its convention in July. Both the representatives of labor and those of employers thought the effect of such an agreement would be far-reaching and that no one would want to be without it after seeing the benefits of its operation, especially as regards harmony and peace in business.

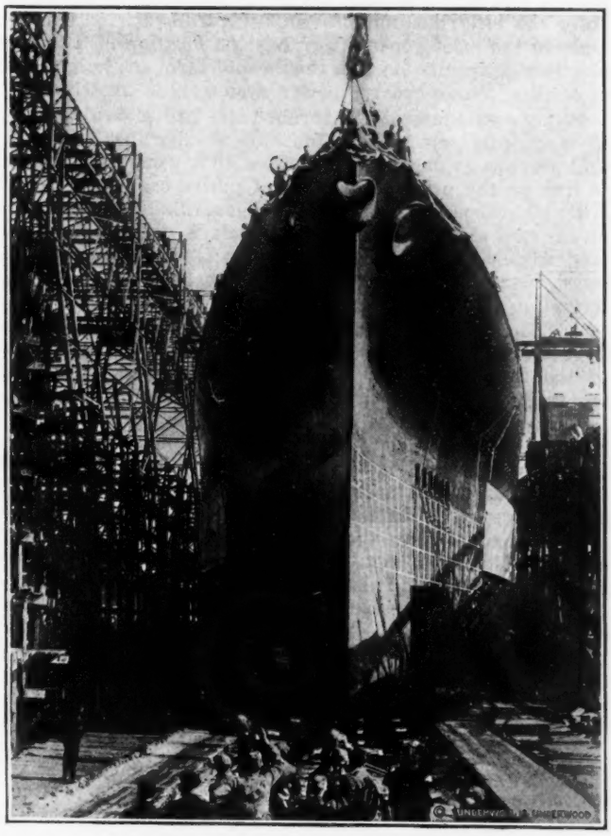
L. F. Post, Assistant Secretary of Labor, made a stirring address on the labor outlook, and there was considerable discussion by the members present on expanding the functions of the Conference Club so as to increase its value to the industry and to the general public. No definite action was, however, taken.

MEETINGS OF SECTIONS OF ASSOCIATED MANUFACTURERS

Meetings of the Various Sections to Be Held at New London, on June 16 to 18—Governors and Trade Committee Also to Meet

General Secretary Charles E. Dustin of the Associated Manufacturers of Electrical Supplies has notified members of the completion of arrangements for holding the summer section meetings at the Hotel Griswold, Eastern Point, New London, Conn., on Monday, Tuesday and Wednesday, June 16, 17 and 18. The board of governors and the international trade committee will also hold meetings on some one of these days.

As the Tennessee Slid Down the Ways



As stated in last week's issue of the ELECTRICAL WORLD, the superdreadnought Tennessee was launched on April 30 at the Brooklyn Navy Yard. The construction of the giant fighting ship embodies all lessons taught by the war, especially in safeguards against torpedo attacks. The ship mounts twelve 14-in. guns as the main battery, with an effective range of more than 13 miles. It is an oil burner with electric drive and has a speed of 21 knots. It is 624 ft. long with a beam of 97 ft. Its displacement is 32,600 tons. The keel was laid May 14, 1917. This Tennessee is the fifth warship of that name to serve in the American Navy.

WILL INFORM THE PUBLIC ON UTILITIES CONDITIONS

Illinois Committee to Give Information About Post-War Utility Situation to Those Responsible for Well Being of Utilities

The public utilities of Illinois, including electric, gas, traction, water and telephone companies, have combined in an effort to place their after-the-war case directly in the hands of the persons to whom they are responsible, that is, their customers. The agency through which this work will be handled is the Illinois Committee on Public Utility Information, 203 South Dearborn Street, Chicago. This committee has been organized under the auspices of the Illinois Gas Association, the Illinois State Electric Association and the Illinois Electric Railway Association. The committee, which is a permanent one, is in charge of Bernard J. Mullaney, director.

In a statement issued by the committee belief is expressed that "the present delicate situation in which the utilities find themselves calls for sane, scientific and non-political, just treatment such as will enable them to perform the services which their customers have a right to demand. The utilities would be in no danger if the economic facts about them were well known. The Illinois utility managers believe it is their duty to customers, investors, employees and the entire public in this reconstruction time to bring this about."

A 40,000-KW. HYDRO PLANT NEAR CHICAGO PROBABLE

Sanitary District Behind Legislation to Get Right to Bid on Power to Be Created as By-product from State's Transportation Canal

The waterway scheme which has passed the Senate of the Legislature of Illinois, and which will provide a transportation waterway from Chicago to downstate and Mississippi River points, contemplates the removal of a dam in the Desplaines River at Joliet and the construction of a modern 40,000-kw. power plant about 4 miles further south at a site known as Brandon's Road. At the same time, there is in the Legislature a bill which will enable the Sanitary District of Chicago to bid on the power from this site either developed or undeveloped. This latter bill, presented by Senator Clark, is being held up by Senator Kissinger for amendment. Should the bill pass in its present form, it would enable the Sanitary District to bid not only on the new power at Brandon's Road but also on the power from the old site which has been the cause of so much court action in which the Economy Light & Power Company was an interested party.

The Jackson Street dam in the Desplaines River at Joliet is controlled by the Illinois and Michigan canal commissioners. They have been leasing this water power since 1855 and for it have received an aggregate of about $2,000,000. The lease of the Economy Light & Power Company expired July 17, 1916. This company had been paying $10,457 a year. The commissioners asked for bids. There were two, from the Chicago Sanitary District and A. J. Cooke. The district offered $15.01 per horsepower a year. Mr. Cooke offered $3 per horsepower per year. The Sanitary District trustees paid the state $41,000 for certain structural changes which the canal commissioners deemed advisable and then appropriated $600,000 for the new construction and development. Then John W. Yeadon, a taxpayer, questioned the authority of the district to make such a lease. The State Supreme Court agreed with the taxpayer and the lease was annulled. Since then the Economy Light & Power Company has been taking the energy from the dam presumably on a month to month basis.

ILLUMINATING ENGINEERING SOCIETY 1919-20 NOMINEES

S. E. Doane Named by the Board of Nomination for President for the Ensuing Year—Other Nominees of the Board

The board of nomination of the Illuminating Engineering Society has announced the following nominees for officers for 1919-20: President, S. E. Doane; vice-president from New York Section, W. J. Clark; general secretary, Clarence L. Law; treasurer, L. B. Marks; directors, E. C. Crittenden, F. E. Cady, R. B. Ely, Walton Forstall, R. H. Maurer and F. A. Vaughn.

SECRETARY LANE ON PLAN FOR POWER RESOURCE SURVEY

Head of Interior Department to Renew Request to Congress for Appropriations to Study Power Situation and Conservation

(From an article by Edgar Mels in the New York *Commercial*, April 29, 1919.)

When the new Congress meets in special session, it will receive a communication from Franklin K. Lane, Secretary of the Interior, which, if his suggestions are followed, is likely to have a far-reaching effect on American industries and, through them, on American business. The Secretary's letter will be a request for two appropriations—one of $50,000, the other of $200,000. Small as this total is, the last Congress refused the request because of the filibustering tactics employed to kill friendless bills.

The request for $50,000 is to make a survey of the undeveloped water power of the United States, estimated at some 35,000,000 hp. The $200,000 is requested to investigate and to survey existing power plants in the great industrial region between Boston and the city of Washington. The latter survey has for its ultimate purpose the erection of steel-tower transmission lines to be constructed from Boston westward to Worcester and Springfield, crossing the Hudson River near Newburgh or Poughkeepsie and then swinging eastward to northern New Jersey and across the Delaware, near Easton, crossing southeastern Pennsylvania near Philadelphia, striking the Susquehanna River below York and extending south to Washington.

The proposed system would connect with existing power stations in Boston, Worcester, Springfield, Hartford, Poughkeepsie, New York, Newark, Paterson, Trenton, South Bethlehem, Philadelphia, Wilmington, Harrisburg, Lancaster, York, Baltimore and Washington. In the region involved there is power-producing machinery capable of 8,500,000 hp., equally divided between industrial and public service plants. This equipment is being augmented annually at the rate of from 500,000 hp. to 1,000,000 hp.

Mr. Lane believes that any pending and projected additions to existing lines and plants should be made in accordance with the bigger projects now in contemplation. In discussing these projects Mr. Lane revealed a systematic and comprehensive plan. He said to the writer:

> In selecting this field for a special investigation it was not intended to ignore the needs of other sections or to suggest that there were not in other sections similar opportunities for improvement in methods of power supply. But our experience during the war had shown that in the area mentioned there were perhaps the largest opportunities for usefulness and especially that there generally existed along the North Atlantic coast a potential, if not an actual, deficiency of facilities for power development and for transportation that might prove a serious handicap to American industrial progress.

Mr. Lane's plan is best told in a letter he sent to the chairmen of the appropriations committees of the last Congress. [This letter was published in the ELECTRICAL WORLD of Feb. 8, 1919, page 282.—EDS.]

In discussing this letter Mr. Lane made it clear that his department had no definite plans worked out as yet. He said:

> The fact that such an investigation as the one for which I asked funds is proposed makes it clear that the engineers of the department have at this time no specific plan to offer. They have not determined as yet what water-power sites may be advantageously developed. They have formed no opinions as to where mine-mouth power plants might best be located. The data are not available to indicate how fully the electrification of trunk-line railways is feasible. Only in the most general way has the location of a master electrical transmission line that would form the spinal cord of such a comprehensive power system been sketched.
>
> In my own State of California there are several systems of electrical transmission that are comparable in length and perhaps in capacity with those that would be required to link up the principal centers of power use of the North Atlantic seaboard. Electric power generated by one stream on the east slope of the Sierra Nevada is used to pump the water from the mines at Goldfield and Tonopah and, 300 miles away, to lift water from beneath the surface for the irrigation of orange groves near Riverside. The extreme tentacles of this system of interconnected power plants now have a reach of nearly 500 miles. In the northern part of the State it is now possible to send power generated on the Rogue River in southern Oregon into San Francisco, 300 miles away. These distances compare with those from Scranton to Portsmouth, N. H., or Altoona to Norfolk. I can conceive of a similar great interstate electrical carrier that would start somewhere near Boston, would extend westward through Massachusetts, past Worcester and Springfield, into the State of New York and would cross the Hudson near Poughkeepsie, sending branches north to Albany and down the river to the metropolitan district. It would then extend southwestward across northern New Jersey into eastern Pennsylvania, crossing the Delaware River near Easton, receiving in this vicinity feeders from power plants in the anthracite region.
>
> The Lebanon Valley furnishes a natural route for the line across eastern Pennsylvania, and it would doubtless reach the Susquehanna River in the vicinity of the large water-power sites south of York. Its extension southward to Baltimore and Washington, and possibly even to Richmond, would be across open country and without any serious obstacles. Near Washington the line could be connected with the proposed electric power plant at the Great Falls of the Potomac.
>
> I feel confident that the development of such a system would make possible the more economical use of coal supplies. If the trunk-line railroads are electrified, their coal requirements will be greatly reduced, and several million tons could undobtedly be saved annually by the operation of electric rather than steam locomotives. A large amount of coal could be saved by the substitution of water power for power now generated by fuels. A large saving of coal can unquestionably be effected if the power needed by these communities is produced in large central stations situated either at tidewater or near the mines in the coal regions, but here too our information is incomplete. It is conceivable, however, that the present power requirements of this region can be met by the use of from 25 to 50 per cent less coal if the power is generated in large central stations either in the coal-mining regions or at tidewater.

The development of water power would not only give employment to hundreds of thousands for a period extending over a number of years, but it would help to solve many an industrial and manufacturing problem. Secretary Lane, however, thinks that there is still another side to cheap electric power and light. In discussing this side, Mr. Lane said:

> The topic of electricity on the farm opens up an attractive vista, but why should not this promise of better industrial conditions on our farms and ranches be followed to its logical conclusion? Electricity in the house to furnish both light and motive power means real help to the farmer's wife, while such a coöperative undertaking as a community cold-storage plant, made possible by cheap electric power, in turn makes possible economic holding of farm products in hands of producers during the season of oversupply.
>
> The automotive tractor and electric machinery together will make agriculture more of a manufacturing business. The greater and more varied the use of electric power, the cheaper it can be sold.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Missouri Association of Public Utilities.—The annual convention of the Missouri Association of Public Utilities will be held on June 5, 6 and 7 at Excelsior Springs, Mo.

Mississippi Electrical Association.—This association, which is affiliated with the National Electric Light Association, held its annual convention in Gulfport, Miss., on April 15-17.

Brooklyn Industrial Exhibit.—The Brooklyn (N. Y.) Engineers' Club recently held an industrial exposition, the electrical division being in charge of the Brooklyn Electrical Contractor-Dealers' Association.

Electrical Credit Association of the Pacific Coast.—The fourteenth annual meeting of this association was held on April 3. C. C. Hillis and Frederic P. Vose, president and secretary of the National Electrical Credit Association, were among the speakers.

Colorado Engineering Council to Be Formed.—Representatives of the nine engineering societies in the state are to compose a new body known as the Colorado Engineering Council. H. S. Sands has been appointed to represent the Denver Section of the American Institute of Electrical Engineers.

Toledo Joint Company Section.—On account of the increased membership of the Toledo (Ohio) Joint Company Section, which now numbers more than 1300, a permanent secretary has been found necessary and David H. Shapiro has been appointed to that position. An entertainment was held by the section on April 28.

Mining and Metallurgical Engineers to Meet in Chicago.—The American Institute of Mining and Metallurgical Engineers will hold its convention in Chicago, Sept. 22 to 26. In addition to the technical talks a social program is being arranged and excursions are planned to the steel mills at Gary, the oil refineries at Whiting, metallurgical plants at East Chicago and North Chicago, and to the La Salle district, where the cement, coal and zinc industries are represented.

New York Electrical League.—At the New York Electrical League luncheon held on April 29 Major David A. L'Esperance of the 369th Infantry, U. S. A., told of the war-time accomplishments of this regiment and Dr. Charles T. Baylis spoke of his experiences in France and Belgium. Victory Liberty Loan notes were sold at the meeting, $25,000 being bought by members of the league. James H. McGraw, president of the McGraw-Hill Company, publisher of the ELECTRICAL WORLD, subscribed a like amount.

Jovian Electric League, Los Angeles.—Sylvester Weaver spoke on "Boosting" at the April 23 meeting of the league. Other speakers were H. N. Sessions and Paul Burke.

I. E. S., Annual Convention.—The 1919 convention of the Illuminating Engineering Society is scheduled to be held in Chicago early in October. The program of this meeting will be announced later.

Ontario Association of Municipal Engineers.—This association purposes holding its next convention at Niagara Falls, Ontario, on June 19, 20 and 21, according to S. R. A. Clement of Toronto, its secretary.

I. E. S., Philadelphia Section.—"Some Practical Measurements of Daylight in Modern Factory Buildings" was the title of a paper given by E. G. Perrot at the April 23 meeting of the Philadelphia Section, Illuminating Engineering Society.

American Association of Engineers.—At the annual convention of this association, to be held in Hotel La Salle, Chicago, on May 13 and 14, Col. Walter Dill Scott, in charge of personnel classification for the United States Army, will give an address on "Fitting the Engineer to His Job." C. E. Drayer, 29 South La Salle Street, Chicago, is secretary of the association.

Associated Engineering Societies of St. Louis.—H. W. Eales, chief electrical engineer Union Electric Light & Power Company, gave an illustrated talk on "Present Practice in Substation Design" at a joint meeting of the Associated Engineering Societies of St. Louis held on April 30 under the auspices of the local section of the American Institute of Electrical Engineers.

American Institute of Electrical Engineers

Milwaukee Section.—On April 16 George A. Laurentz, president of the Louis Laurentz Aeroplane Company, Chicago, gave an illustrated talk on "Aëroplane Construction."

Panama Section.—A paper by William R. O'Connell entitled "Testing of Hydraulic Turbines" was presented at the meeting of March 30. The annual business meeting for the election of officers will be held on May 23.

Schenectady Section.—A special meeting participated in by representatives of the American Institute of Electrical Engineers, American Societies of Civil and Mechanical Engineers, National Electric Light Association, American Chemical Society and Society of Engineers of Eastern New York was held on April 23 to discuss the development of local and national society affairs.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Minimum Charge.—A decision has been rendered by the New York Public Service Commission, First District, on the lawfulness and reasonableness of a minimum charge for electric service by the Bronx Gas & Electric Company. A part of this decision reads as follows: "The provision in the new rate schedules of the Bronx Gas & Electric Company for a minimum charge of $1 in connection with the statutory maximum of 12 cents per kilowatt-hour, and the admitted action of the company in demanding and collecting such a minimum charge, is contrary to and in violation of law, and it is the duty of the commission to prohibit and prevent the continuance of such an exaction. A hearing thereon having been held before the commission, its exaction and collection should now be prohibited, and an appropriate order to that effect should be entered. If the company does not defer to this ruling and withdraw this minimum charge, appropriate proceedings by mandamus or injunction should be instituted."

Where Margin Between Income and Outgo Is Narrow.—The Illinois Public Utilities Commission has issued an order on the petition of the Farina Electric Company for authority to increase street-lighting rates. It says in part: "The margin between the revenues received and actual money paid out for the operation of the property is so narrow that the question of the reasonableness of the expense items and the value of the property cannot materially affect the issue. The commission believes that it would be improper to charge street-lighting service in Farina with more than its justly proportionate share of the expense of operation or to expect the village of Farina through its street-lighting service to make up the losses and deficiencies occasioned by the residential and business lighting consumers. However, it appears that this will not result from the rates as proposed herein. At the hearing some question was raised as to the ability of the village to pay the increased amount proposed for street-lighting service, and the commission in its order hereinafter will care for this phase of the situation. The commission finds that the rates as proposed should be permitted to become effective as of Jan. 1, 1919, provided that the funds in the fire and light appropriation of the village of Farina are sufficient to pay the increased amount without a reduction in the number of street lights."

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Lighting Department Not Affected in Chattanooga Receivership. — Pending further court proceedings, John S. Graham, Philadelphia, and Percy Warner, Nashville, who have been appointed temporary receivers of the Chattanooga Railway & Light Company, are limited in their activities. The receivership covers the street railway property and property used in connection therewith, but does not cover the lighting department, and the question of a receivership over the lighting department was reserved for further consideration by the court.

Occupations in Electrical Manufacturing Industries for Men Disabled in the Service.—The Federal Board for Vocational Education has prepared a monograph, No. 25 in the vocational rehabilitation series, on "Occupations in the Electrical Manufacturing Industries" for disabled soldiers, sailors and marines, to aid them in choosing a vocation. The subjects covered are engineering and drafting, coil winding and taping, coil impregnating and painting, coil placing and connecting, assembling, inspection and repair and testing. The booklet is issued by the board in coöperation with the office of the Surgeon-General, War Department, and the Bureau of Medicine and Surgery, Navy Department.

Water Power in Scandinavia.—Notes on Scandinavian power developments have been sent by United States Commercial Attaché Erwin W. Thompson from Copenhagen, Denmark. Transmission of electric power to the city of Stockholm from the new power station near Untran is just beginning. It will deliver about 14,000 kw., which is only about half of what the power station can produce, but this alone will save the city coal to the value of $4,000,000. Nordsjællands Elektricitets of Sporvejs Aktieselskab of Copenhagen will increase its capital stock from $2,010,000 to $2,680,000. This company was incorporated in 1902 with a capital of $402,000 to take over and extend an interurban electric car line north of Copenhagen and to supply light and power to the country districts and villages. The capital stock was increased in 1907 and 1911 up to $1,340,000, and in 1912 a contract was made with the Sydsvenska Kraftaktiebolaget for the delivery of 1000 hp. of electricity (to be increased later to 5000 hp.) from several hydroelectric plants in south Sweden. The current was conducted under the sound from Helsingborg, Sweden, to Helsingør, Denmark, through a nine-strand cable 3¼ miles long with a voltage of 25,000. Shortage of coal in Denmark intensified the demand for electricity, but the impossibility of obtaining cables and other apparatus during the blockade has prevented further developments. It is supposed that the present increase of capital is primarily intended to provide for more electrical transmissions from Sweden.

Financing California Development.—Under the terms of the order issued by the California Railroad Commission in the matter of the application of the Great Western Power Company of California for authority to issue $7,500,000 of stocks and bonds to finance hydroelectric development, the Great Western Power Company and the City Electric Company, both of which will be taken over by the Great Western of California, are authorized to issue bonds as follows: Great Western company, $2,407,000; City company, $1,564,000. These bonds, however, are not to be sold, but are to be delivered to the trustee under the one-hundred-and-fifty-million-dollar mortgage provided for in the financial plan submitted to the commission. The trustee is to hold the bonds as collateral security. The bonds of the old companies are not included in the six-million-dollar issue authorized by the commission, the proceeds of which, together with the returns from the sale of $1,500,000 of 7 per cent preferred stock, are to be used (except $350,000) to finance the company's development plans. The $350,000 is to be used to pay a note. The commission stipulates that the $6,000,000 bonds shall be sold for not less than 88 and the preferred stock at not less than 90.

Utility Rate Cases in Illinois.—The first annual report of the Department of Trade and Commerce, Division of Public Utilities, covering the period July 1, 1917, to June 30, 1918, shows that within that period the Public Utilities Commission of Illinois received applications for permission to increase rates as follows: Electric, 94; gas, 58; heating, 21; water, 25; total, 198. Each of these applications represents the appeal of one company, and the figures given do not show the number of communities affected. Between Jan. 1, 1918, and July 1, 1918, 1957 electric schedules were filed with the commission. These figures count the schedule for each community as one. The report states further that on June 30, 1918, out of the ninety-four cases involving increase in electric rates, the commission had approved sixty-five, disapproved five and twenty-four were pending. Of the fifty-eight gas cases, twenty-six were approved, none was disapproved and thirty-two were pending. Of the twenty-one heating cases, six were approved, two disapproved and thirteen were pending, all of which were nearly ready for orders. Of the twenty-five water cases, six were approved and nineteen were pending.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Assumption of Risk by Crane Operator.—In an action for the death of a workman killed while operating a crane, after his complaint of its dangerous condition and assurances that repairs had been made, the Supreme Court of Pennsylvania has held on the evidence that its dangerous condition on the day of the accident was not such that an ordinarily prudent man would undertake its operation, so that assumption of risk was for the jury. It was also held by the court that a servant acting in an emergency to save the life of others is not charged with the consequences of errors in judgment resulting from excitement and confusion of the moment (106 A. 102).

Commission Cannot Increase Rates Fixed by Statute.—Although the city of New York was not a party to a proceeding by Public Service Commission, First District, against the Brooklyn Borough Gas Company to fix gas rates, the Supreme Court of New York has held that the city could intervene and has vacated an order which the court was without power to make, although entered with consent of all parties legally interested. If the Laws of 1906, Chapter 125, fixing gas rates at $1, are still in force, the order of Public Service Commission and a judgment of the court fixing the rate at $1.10 is void, although made and entered upon consent of all parties legally interested (175 N. Y. S. 28).

Installation of Underground and Overhead Lines.—An ordinance of St. Louis, Mo., establishing the district where electric wires are required to be laid in conduits authorized and required applications for permits under the ordinance to be filed within ninety days. It also required acceptances of provisions of the Ordinances of 1895, granting the privilege to place wires along streets and alleys and public places within the time provided by the ordinance, to be filed, any time limit previously existing having been brought down to the date of the ordinance. In a case in which these regulations were involved the St. Louis Court of Appeals has held that a power company, by acceptance of terms prescribed by the ordinance within the time therein prescribed and by compliance with the provisions of Revised Code of Ordinances of 1895 within the time designated in the ordinance, obtained authority to erect poles and string overhead electric wires in the district proposed outside of the restricted underground district established by the ordinance (210 S. W. 90).

Men of the Industry

Changes in Personnel and Position— Biographical Notes

Lieut.-Col. W. R. Thompson, manager of construction and engineering of H. M. Byllesby & Company, Chicago, landed in New York from overseas recently. Colonel Thompson has been in uniform since completion of the second officers' training camp at Fort Sheridan, from which he was sent as an instructor to Deming, N. M., commissioned as captain. Later he was made a major and sent to France with the 109th Engineers. About the time the armistice was signed he was promoted to the rank of lieutenant-colonel in the same regiment.

Lewis Nixon, State Superintendent of Public Works of New York, has been appointed Public Service Commissioner by Governor Smith for the First District of New York (Greater New York) in charge of regulation. Mr. Nixon was born at Leesburg, Va., fifty-eight years ago and was graduated from the Naval Academy in 1882. He served on the staff of the chief constructor of the navy, being detailed to Cramps, Philadelphia, and to the Navy Yard in New York. He afterward operated his own yard at Elizabeth, N. J. As a naval constructor he designed the Oregon, the Indiana and the Massachusetts. Mr. Nixon won national fame as the man who built the first really big battleship of the American navy, the Oregon.

H. E. Brandli, who has recently been elected president of the Mississippi Section of the National Electric Light Association, is vice-president and general manager of the Meridian (Miss.) Light & Railway Company. Mr. Brandli became associated with that company in the summer of 1917. He was at one time superintendent of lighting of the Ottumwa (Iowa) Railway & Light Company, leaving that position in the summer of 1912 to become manager of the Consumers' Power Company at Minot, N. D. A year later he was made general manager of the Citizens' Gas, Electric & Heating Company at Mount Vernon, Ill., and when that property was sold by H. L. Doherty & Company to the Frye interests he resigned to take up the management of the Meridian company.

C. J. Berry, electrical engineer with the National Lamp Works at Cleveland, has resigned to take up engineering work with the firm of Brandt et Fouilleret at Paris, France. Mr. Berry has been with the National Lamp Works for six years, becoming connected with that firm after being graduated from the electrical engineering course at the Massachusetts Institute of Technology in 1913. During 1918 Mr. Berry served as a first lieutenant in the United States Air Service in France, where he undertook radio and aviation lighting work. While with the National Lamp Works he has been the inventor of several electrical devices for use on lighting distribution systems. Mr. Berry is an associate member both of the American Institute of Electrical Engineers and of the Illuminating Engineering Society.

Stephen C. Pohe, who for the last year has been general manager of the Penn Public Service Company at Clearfield, Pa., has been appointed vice-president of the operating companies controlled by the Pennsylvania Electric Company of New York City and having offices at Clearfield, Somerset and Johnstown, Pa. Mr. Pohe's headquarters will be at Johnstown, where general offices of the companies have recently been established. He will

STEPHEN C. POHE

direct the operating department of the system from that point. Mr. Pohe resigned as manager of the Columbia & Montour Electric Company and of the Northumberland Gas & Electric Company at Bloomsburg, Pa., in 1918 to become general manager of the Penn Public Service Company, from which position he has been advanced. Since entering the central-station field directly after graduating from the Potts Business College in 1902, Mr. Pohe has been associated with companies operating in the section in which he now resides. He has been active in the work of the Pennsylvania Electric Association and was elected president of that organization in 1915.

John F. Vaughan, whose resignation as district manager of the Emergency Fleet Corporation for the New England district has been accepted, to take effect on May 1, will resume his engineering practice. While employed in the government service since January, 1918, his engineering office at 185 Devonshire Street, Boston, has been in charge of his principal assistant, E. A. Ekern. Before taking up consulting work Mr. Vaughan had been associated with the Stone & Webster Engineering Corporation of Boston for about fifteen years, paying special attention to electrical transmission and hydraulic engineering problems. Before that he was associated with the late Col N. H. Heft in the early electrification work of the New Haven & Hartford Railroad on the Nantasket Beach and other lines. He is the inventor of the Vaughan flowmeter and has served as a member of committees on prime movers of the N. E. L. A.

Ralph Frost, who recently returned from France after service with Company A, Twenty-seventh Engineers, has been appointed superintendent of the electrical branch of the municipal lighting plant at Wakefield, Mass.

Major John L. Retallack has been appointed by the government of British Columbia public utilities commissioner for the province under the new public utilities act. Major Retallack is a returned soldier, having gone overseas as quartermaster of the Forty-eighth battalion. Later he was transport officer in the railway corps. He is a mining engineer and a member of the Canadian Mining Institute.

P. J. Morrissey, for a number of years general manager of the Citizens' Light, Heat & Power Company of Pennsylvania and the Penn Electric Service Company, with headquarters at Johnstown, Pa., has been made vice-president in charge of the generating, mining and power departments of all the operating companies of that section which are under the control of the Pennsylvania Electric Company of New York City.

William A. Sullivan has resigned as manager for the Shreveport La.) Railways to accept the position of general manager of the Gulfport & Mississippi Coast Traction Company, which controls city, interurban and electric lighting companies in and between Pass Christian and Biloxi, Miss. Mr. Sullivan has been manager of the Shreveport Railways for the last nine years. He was formerly with Ford, Bacon & Davis at Birmingham, Ala., and Little Rock, Ark.

Obituary

Charles H. Stevens, for the past fifteen years head of the power sales department of the Lynn (Mass.) Gas & Electric Company, died at his home in Lynn on April 26, after a two weeks' illness following a severe attack of influenza.

Edward B. Sturges, formerly president of the Lackawanna Electric Power Company and organizer of the Suburban Electric Light Company, now a part of the Scranton (Pa.) Electric Company, died on April 8 at his residence in that city. Mr. Sturges was a prominent promoter of electrical and railway properties in Scranton in the early days of electric service. He was seventy-four years of age.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

LIFTING OF BLACKLIST TO HELP ELECTRICAL EXPORTS

Enemy-Controlled Electric Light and Railway Interests Greatly in Need of Equipment and Supplies

Action of the War Trade Board wiping out its blacklist on April 29 should be reflected in the exports of electrical goods, especially to South America. Included in the lists were a number of electric lighting plants and electric railways besides a number of electrical trading concerns. In the past the properties and concerns purchased, because of their relations, electrical equipment of German make.

For more than four years there have been no German imports into South America, and the stocks on hand in the summer of 1914 were quickly absorbed. A belief in the statement that victory was near for Germany kept these plants out of the market pretty much for some time. But for the last year and a half or more they have been on the Allied blacklist and so could not buy from the principals.

Now Germany cannot supply their needs and their needs are many. There is an opportunity therefore for American electrical goods.

European neutrals also offer, through this action of the War Trade Board, a greater outlet for electrical goods.

NO DECLINE EXPECTED IN SCHEDULE MATERIAL PRICES

Accumulations of High-Priced Copper and Other Metals and Increases in Certain Raw Materials Preclude Any Drop on This Score

The price question is the chief interest in the schedule material market at present. Considering the drop in copper, the buyer may ask why prices should not reflect this. The answer lies, according to the manufacturer, in the following considerations: Assuming selling price at 100 per cent, the cost of labor for small wiring devices might be taken as 25 to 30 per cent; raw material, 30 to 35 per cent; selling expense and overhead, 20 per cent; profit, 20 per cent. A maximum fall in the price of copper of, say, 33⅓ per cent would not permit a reduction of more than 10 or 12 per cent in selling price if the manufacturer immediately began to use the lowest-priced raw material; and where he was heavily stocked on raw material purchased at war prices it would be out of the question to expect any substantial reduction in sales price until the high-cost supply had been largely worked out.

One representative manufacturer had $500,000 worth of high-priced copper on hand on Jan. 1 (eight months' supply), and by the middle of April had received practically no copper bought around the lower quotations. Price advances in porcelain—say 40 or 50 per cent toward the close of the war—further tend to reduce the benefits of lower-priced copper, and, finally, it is believed in manufacturing circles that copper prices will not remain long at present levels but will tend to increase materially with increasing demand. On the heavier and simpler material, like knife switches of large size, the labor cost might run as low as from one-half to one-third the material cost.

By and large, there appears to be small ground to expect lower prices on wiring devices for some time, and it is significant that one manufacturer recently accompanied his bid with a guarantee to bear the cost of any shrinkage in prices below the quotation made during 1919. A better selection of labor is now feasible, and increased efficiency is being studied.

Reductions in the price of steel as thus far obtained have practically no effect on the cost of switch boxes. The volume of orders is well maintained, but the amount of money involved is probably a third or more less than at the height of the war.

INDUSTRIAL ELECTRIC TRUCK MARKET QUIET

Outlook, However, Is Promising, with No Indication of Extensive Decrease in Prices—Many Propositions Being Analyzed

On account of the transition period through which manufacturing industries are passing in many localities, the sales of industrial electric trucks appear to be somewhat below normal just at present. That this condition is merely temporary is apparent from the most cursory survey of the achievements of this class of equipment during the war, and long before it, in the saving of labor and time in internal industrial transportation. It is not the practice of distributers to carry large local stocks of trucks for immediate shipment, but factory deliveries are in good shape and the absence of embargoes assures reasonably prompt transit in most cases. A good many propositions are being analyzed, and the number of quotations shows that as soon as intensive production can be established in manufacturing plants on the basis of sound business conditions throughout the country numerous installations can be made to advantage. Government truck business is expected to show a decided improvement as soon as Congress meets and passes the necessary naval appropriations. It is unlikely that prices will fall off to any great extent for some time in these equipments. The present is an unusually desirable time for manufacturers and forwarders to investigate the possibilities of these efficient speeding-up devices, and purchases made in time to anticipate expansion of production are likely to be money earners for truck buyers.

STEEL PRICES AGAIN UP FOR CONSIDERATION

Prevailing Uncertainty in This Connection Has Prevented the Electrical Market from Showing a Greater Volume of Sales

That business is not greater to-day by a considerable volume is because of the stabilized steel price fiasco. Evidence is found in many places that buying and building construction are being held up not so much because prices are high as because of the uncertainty of the steel-price situation. Iron and steel are so fundamental in business progress that uncertainty in steel is reflected by duller conditions in other markets. The copper market, for instance, is stagnant solely as a result of the steel-price uncertainty.

The domestic electrical market feels this condition very much. While business is better than it was, it is by no means so large as it should be. All kinds of wiring de-

vices and supplies should show evidences of better demand once the steel-price situation is cleared up. Transmission-line construction is not so much dependent on steel. In fact, this work should be going ahead now with great rapidity because line materials are, generally speaking, about as low as they will be for some time.

Representatives of the steel producers and the Railroad Administration are scheduled to meet late this week. Even if the stablized price program is adhered to, it is doubtful whether any prices, except rail, perhaps, will be lowered. A great many people are urging the discontinuance of such prices and the return to a free and open market. This latter plan seems best. Buyers know what to expect. Fixed prices are fair neither to the buyer nor to the seller.

There are indications that a free and open market for steel would momentarily bring lower prices. As soon, however, as sufficient buying had been stimulated increases would probably follow.

METAL MARKET SITUATION

Light Copper Demand Not Affected by Price at Which Metal Is Offered

There is little of especial interest in the present copper market. Prices are holding firm. The price at which copper is offered to consumers appears to have no effect on the volume of buying. A possible purchaser with little outlet for his wares is not interested in copper at any price within reason. So with the light demand the volume of business is light.

It is estimated that present domestic consumption of copper is at the rate of 45,000,000 lb. for the month, while total domestic shipments for April were in the neighborhood of 30,000,000 lb. Average production in the United States has been given as 60 per cent of capacity. There is talk of production being cut to 50 per cent, but a cut to this figure would bring the cost of production relatively considerably higher than at present, and where this ratio of production has been reached by some companies the cost of producing has been found to be above the selling price.

Prices in the London market are £1 easier than last week. It is becoming more difficult to make sales to British consumers now that Japan and Australia are active competitors in copper.

Spelter has decreased to 6.35 cents, and considerable trading for export is the result. The final plans for the disposal of government stocks have not yet been perfected.

Scrap metals are quiet. Old scrap zinc is off ¼ cent. Scrap brass and copper have a small measure of sales. Government material in rather large quantities is still offered for sale.

NEW YORK METAL MARKET PRICES

	April 29	May 6
Copper:	£ s d	£ s d
London, standard spot	76 15 0	75 15 0
	Cents per Pound	Cents per Pound
Prime Lake	15.62½	15.62½
Electrolytic	15.37½	15.37½
Casting	15.00	14 90
Wire base	17.25 to 18.00	17.25 to 18.00
Lead, trust price	5.00	5.00
Antimony	7.00	7.12½
Nickel, ingot	40.00	40.00
Sheet zinc, f. o. b. smelter	10.00	10.00
Spelter, spot	6.42½	6.35
Tin	Govt. price 72.50	Govt. price 72.50
Aluminum, 98 to 99 per cent	31.00 to 33.00	31.00 to 33.00

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	13.50 to 13.75	13.50 to 14.00
Brass, heavy	7.50 to 8.00	7.50 to 8.00
Brass, light	6.50 to 7.00	6.50 to 7.00
Lead, heavy	4.00 to 4.25	4.00 to 4.25
Zinc, old scrap	4.25 to 4.50	4.00 to 4.25

THE WEEK
IN TRADE

THE volume of sales booked seems to be getting larger right along. Because of the decreasing amount of unfilled back orders sales billed by manufacturers are not so favorable. However, the outlook is very favorable, and the fall months of 1919 should find the electrical industry running at pretty near top speed.

Exports are developing very satisfactorily. During March last there was exported from the port of New York alone, according to the National City Bank of New York, $409,325 worth of batteries and $957,628 worth of insulated wire.

Reports on equipment in A. E. F. depots show an increase in the stock of copper wire and cable on hand. As of March 1, there was on hand 114,000,000 ft., an increase over Nov. 1 of 22,700,000 ft. Both motor and generator stocks are lower, 350 motors and 230 generators being on hand March 1.

A shortage in certain lines, particularly flexible armored conductor, is reported. Lamps, on the other hand, are reported to be overstocked. Heavy demand on domestic socket appliance stocks continues.

NEW YORK

Market conditions for electrical apparatus all over the State of New York are steadily becoming better. This is the attitude expressed by a prominent jobber on his return from a tour of the state. Motors in sizes up to about 20 hp. enjoy the same sales up-state as they do in the lower sections. The same is true of vacuum cleaners and washing machines. On the other hand, wiring devices have a quiet market up-state and down-state. Conditions are not localized but general in this territory, and the tendency is steadily upward in an encouraging way.

April has been reported a good jobbing month, and May is starting out in an encouraging manner. Industrial collections are holding well; those from retailers are likewise good. The only long collections reported in the jobbing trade are from some contractors. The whole class of contractors suffers to some extent on this account and probably will continue to do so until those who carry their credit system under their hats are brought to realize that they owe an obligation to the responsible members of their trade.

WIRELESS.—In the last two weeks sales of wireless-telegraph instruments, accessories and supplies have increased considerably. Deliveries are practically from stock. Development of wireless-telephone sets for commercial use is under way, and one manufacturer expects to have transmitters on the market in about eight weeks. These will have a radius of approximately 30 miles and will sell in the neighborhood of $120. The source of electrical supply will be the commercial alternating-current lighting circuit.

FLEXIBLE ARMORED CONDUCTOR.—The heavy demand is causing a shortage in supply, according to reports from jobbers. Although the demand in the metropolitan district is not so high as that in the West and Middle West, the supply in this section is nevertheless affected.

SCHEDULE MATERIAL.—Notwithstanding the amount of wire used, the demand on wiring devices in general hardly seems to be up to expectation. Price cutting is being indulged in by jobbers in order to obtain the business which is going through.

FUSES.—Orders are in the nature of 100 boxes when formerly they were for 1000 boxes. These orders seem to be of normal volume in number but each one smaller in number of units, and in general they are resales.

FANS.—Sales to retailers are opening up and stocks are being shipped. Some jobbers are ordering additional

stocks. The recent warm days were a small reminder of what may follow.

INSULATORS.—An increase of 5 per cent on high-voltage porcelain guy insulators has been reported. Shipments can be made from the factory in two weeks.

WOOD CROSS-ARMS.—Sales are reported to be on the increase. Deliveries are from stock.

RUBBER-COVERED WIRE.—No changes in base have been reported. House-wiring campaigns throughout the country are causing considerable movement in wire, although the New York section is not so active in this respect as are some other sections.

CHICAGO

While there are no large strikes of a spectacular character in the Middle West at the present time, there appear to be a large number of smaller disturbances. One electrical manufacturer reports that his business in farm plants has been hampered by a strike at the factory. Orders are rolling in, but there is no way to fill them. Another manufacturer of electrical specialties in Wisconsin is reported to have closed his plant definitely and made arrangements for producing his output elsewhere because 400 of his 600 employees voted against accepting the wage advance offered them, they considering it not enough. The manufacturer has stated that the plant will not be reopened. The closing was caused by the demands made by the machinists and polishers. The machinists asked a 10 to 20 per cent increase, and the polishers asked an increase from 67½ to 80 cents an hour. The company was willing to give the polishers 70 cents an hour.

Such labor troubles as these and the fact that the Victory loan is lagging seriously in the Chicago district are causing a slacking of business. This situation is reflected this week in the building permit record, which dropped to $710,400, or about half the amount it had been running weekly. Banks are not loaning freely because they feel they must wait until they learn how much they must take of the Victory loan.

In the jobbing trade business is reported about the same. Prices are steady except for some slight decreases, which are due more to competitive conditions than to market changes.

COPPER WIRE.—Both weatherproof and rubber-covered copper wire are holding firm on the 20-cent base.

CONDUIT.—While building operations are apparently going ahead, according to building permit records, the jobs are mostly small, and, coming into the electrical jobbing houses in such small quantities, conduit does not appear to be moving. When the situation is analyzed, however, it is realized that a considerable quantity of this material is being sold for construction projects of minor character.

SCHEDULE MATERIAL.—Some of the jobbers who have reduced their prices to the trade on standard items of schedule material figure that it is merely a situation brought about by competitive conditions.

32-VOLT APPLIANCES.—These items are finding ready sale as the spring permits the farm-plant agent to become more active in his field canvassing.

INDUSTRIAL HEATING DEVICES.—While some of the jobbers in Chicago do not object to the recent change in discounts on industrial heating devices, there apparently has been some objection to this on the part of other jobbers, who are basing their objections on the priciples involved. They contend that if the differential on the regular line of heating devices were higher, they would not object so much to this policy in connection with the industrial devices, in which they do not deal largely.

SMALL MOTORS.—There apparently is no let-up in the extraordinary demand for small motors. Manufacturers of devices such as washing machines, vacuum cleaners, etc., are finding it very difficult to secure an adequate supply.

FANS.—Middle Western fan manufacturers report that this field is now beginning to show considerable activity.

FUSES.—Industrial conditions do not seem to have had any immediate effect on the fuse market, as some Middle Western manufacturers are finding it difficult to catch up with the orders that are coming in.

TRANSFORMERS.—Foreign business is occupying the attention of a number of transformer manufacturers, the majority of this coming from Norway and Switzerland.

LAMPS.—The problem in the lamp field now is to reduce consigned stock. It is reported by one company that some of its distributers have as much as a year's supply on hand.

BOSTON

Jobbers report a better feeling in the trade, with a fair volume of orders for maintenance and reconstruction work. Little gain can be seen in building operations this week, but as soon as the Victory loan is out of the way and the peace treaty signed a substantial expansion is anticipated. Deliveries are good in most lines, though shortages are reported of wire of No. 6 and smaller sizes and armored flexible conduit is scarce. A price reduction of 20 per cent was announced on a prominent make of electric flashlight this week. Other prices are holding steady around last week's levels. Central-station house-wiring campaigns are continuing with good results. Household appliances continue to show great activity. Manufacturers' agents report an increasing volume of inquiries. Collections are a little slow, and stocks are somewhat "spotty." Little speculative buying is to be seen at this time, and many jobbers are buying from hand to mouth. On the other hand, recent buying of wire by contractors for delivery over a period of six months reflects activity of a desirable kind. Labor conditions in the electrical field are unusually quiet.

MOTORS.—Inquiries are rapidly increasing, and one distributer remarked Monday that if he could "cash in" upon one-third of these he would be doing a splendid business. Stocks are in excellent shape, with occasional exceptions. A scarcity of small direct-current motors is noted.

SCHEDULE MATERIAL.—Orders are well maintained and a large amount of betterment work is under way in factories. Stocks are well in hand.

WIRE.—Steady prices are reported, with many predictions of a later increase. Some ordering for delivery over fairly long periods is noted. Central-station line extension and betterments are absorbing a fair quantity of wire. Bare wire is quoted this week at 18 cents base, rubber-covered at 20 and weatherproof at 19. Considerable wiring of old houses is under way in different parts of New England. Flexible metallic conduit and wire in sizes below No. 5 are scarce.

FLASHLAMPS.—A reduction of 20 per cent in the price of "Ever-ready" flash lamps was announced Monday. Jobbers are preparing for the vacation trade.

FANS.—Dealers are buying very cautiously. The public is holding off for lower prices, but a hot wave will start the fan trade along so fast that it is doubtful if stocks will be equal to the demand.

WASHING MACHINES.—These outfits continue among the season's "best sellers." The servant problem continues acute and electrical labor-saving devices for the home are in great demand.

ELECTRIC RANGES.—A prominent New England manufacturer is running full time and is quoting two weeks' delivery. Prices are firm and seem likely to hold so. A two-carload order for California is about to be started from the Simplex factory at Cambridge.

INDUSTRIAL ELECTRIC TRUCKS.—Sales are rather quiet at the moment, but a fair volume of inquiries is being handled, and a solid growth of business in these labor-saving equipments is anticipated this year. If general business increases as it should following the peace treaty, manufacturers will be hard pressed to meet the demands.

VACUUM CLEANERS.—A brisk trade is being handled, and some intensive central-station campaign work is being conducted with great effectiveness, notably on the Central Maine Power Company's system.

ATLANTA

Reports coming in from Birmingham, New Orleans and Jacksonville, combined with information secured in the Carolinas and Georgia, indicate that business in general is well maintained by numerous orders of comparatively small amounts but which in the total show a substantial aggregate. Jobbers are doing a good business and appear to be very well pleased with the present conditions. At the same time their purchases from the manufacturers are made in smaller lots for quick turn-overs. Retail sales are excellent and well ahead of the corresponding period last year. The much-looked-for building movement has started in the Southeast. Building operations at Atlanta for April are 100 per cent above 1917, and construction for the first quarter of 1919 shows an increase of 55 per cent over the first quarter of 1918.

FANS.—Jobbers have registered a lively trade this week through anticipation of dealers covering their early summer requirements. The movement of large shipments to points further south has about ceased.

STORAGE BATTERIES.—Dealers report a brisk trade as an outcome of the increasing automobile demand. The volume of sales so far this year exceeds expectations, and while shipments are improving daily some difficulty is experienced in meeting insistent calls. Prices have stiffened.

METERS.—The volume of sales is satisfactory, and the surprising feature is the steady influx of orders from the small central stations for residence type. The demand for meters of other types has lessened considerably. Prices remain firm. Local stocks are holding up and deliveries are normal.

CABLE.—A few jobbers state that the requirements from industrial sources are growing. Lead and cambric-covered cables have been active. Weatherproof is moving rapidly. A substantial order for immediate delivery was placed late this week at a shade off market.

TRANSFORMERS.—Business in the larger power type shows signs of a revival. This condition is spotty, however, and nothing in the nature of a general improvement can be looked for until the larger electric utilities become more active in going after power business. Following closely the trend of 5-amp. and 10-amp. meters, 2300-volt distributing-type transformers enjoy a fairly active market. Stocks are normal.

ORNAMENTAL LIGHTING.—Manufacturers and dealers in post and ornamental fixtures are optimistic. Inquiries are becoming more numerous, and quite a good business is developing in the way of profitable orders. There is a big field for these as evidenced by the desire of small municipalities to make such improvements.

STREET LIGHTING.—A lively market is opening up for all types of fixtures. In replacement work the old arc lamps are being discarded for incandescent units, and standardization of equipment has stimulated this demand. No price change has been recorded in some time. Factory deliveries are getting better.

LAMPS.—The shortage in 75-watt and 100-watt lamps has disappeared. A sag in the general volume of transactions is noted.

SEATTLE—PORTLAND

Seattle jobbers and dealers report that the condition of sales is low and business is lagging. This condition is attributed primarily to the Victory loan drive. Many business men are throwing aside personal interests to work for the loan. With the uncertainty over existing contracts and the prospects for new ones more or less indefinite, shipyard owners refuse to stock in excess of needs. Both jobbers and dealers report a healthy movement of domestic appliances, particularly washing machines and ranges. Sales of flat-irons during the week showed a noticeable increase. Every jobber in this district, according to first-class authority, is well stocked in every line carried by jobbers; in fact, many of them are overstocked. There has been no decrease in prices noted recently. Wire, which has dropped three times since Jan. 1, has held firm for the past six weeks. Collections are keeping pace with sales, but the loan drive is affecting both. Very few new credits are being placed.

Manufacturers' agents and jobbers in electrical lines in the Portland district report last month's business as only fair. A decrease is shown over that of March and a considerable decrease over April last year. Retail electrical business is reported to be in good condition, gross sales being appreciably greater than for April, 1918, as well as greater than for March of this year.

Permits issued for building construction cover a total expenditure of 90 per cent more for the first four months of this year than for the similar period last year. The increase for April this year over April of last year was 160 per cent. Building activity seems to be along two definite lines, public garages and dwellings. Collections are reported as only fair.

Industrial activities, particularly lumbering and logging, are growing, and prospects are that conditions will continue to improve.

Poles and pole-line materials sales, which have been dragging heavily for a considerable time, received a fresh impetus when an unexpected order for poles, wire, cross-arms, etc., developed for maintenance and some new extensions to rural transmission lines in western Washington. This order is the first of several long anticipated.

SAN FRANCISCO

During the past week there has been a great deal of agitation over the threatened cancellation of Pacific Coast shipbuilding contracts. Chairman Hurley of the Shipping Board, however, has just advised Pacific Coast shipbuilders that their contracts will remain intact, although it is possible that ships of new designs will be substituted in some cases. This news is highly welcome to Pacific Coast interests, for in the San Francisco Bay district alone shipyards give employment to 75,000 people.

Another one of California's industries is threatened, and there seems to be no remedy—the grape industry. The fruit season is progressing nicely, and all crops look to be close to the record. California mines are operating at only about 50 per cent capacity. Nevada mines are in the midst of the biggest boom in ten years, and Tonopah and Goldfield are seeing a revival of their best days.

Collections are fairly good, although there is a constantly increasing tendency to extend the time of payment, probably because of the dealers' entry into the high-priced device business, such as washing machines and the like. Ninety days' time is rather the rule than thirty days' time.

TELEPHONES.—Eastern factories are now making good deliveries, and rural lines especially are showing more extension and improvement work than they have for years.

MOTORS.—Several large export orders were reported during the past month. Sales of this material are running below last year, especially for irrigation.

RANGES.—The Pacific Gas & Electric Company is developing a plan whereby it hopes to place several thousand ranges on its line within a few years. The scheme, although not yet fully completed, will depend upon the dealers' co-operation, and liberal inducements in the way of carrying customers and wiring allowances have been made dealers and consumers respectively. Range prices have recently increased slightly because of the application of a revised freight rate.

LINE MATERIAL.—Only needed extensions are being made, but several of these are reported, covering bolts, cross-arm braces, pins, cross-arms and a very few poles.

HEATING DEVICES.—The market for small devices is rather quiet, although solicitors are now being placed in definite zones which they will work over for dealers who have made applications for their services. An especial drive will be made on such devices as percolators and chafing dishes, as all feel that these have not yet been worked to their capacity.

INSULATING MATERIAL.—The market is fairly steady. Stocks are good, but the demand in general is considerably lighter than that of last year.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges or account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit.

Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

	No. 14 Solid	No. 12 Solid
Less than coil	+10% to 20%	+10% to 20%
Coil to 1000 ft.	List to 25%	List to 25%

Twin-Conductor

	No. 14 Solid	No. 12 Solid
Less than coil	+10% to 20%	+10% to 20%
Coil to 1000 ft.	List to 25%	List to 25%

DISCOUNT—CHICAGO

Single-Conductor

	No. 14 Solid	No. 12 Solid
Less than coil	+20%	+20%
Coil to 1000 ft.	List	List

Twin-Conductor

	No. 14 Solid	No. 12 Solid
Less than coil	$115.00	+20%
Coil to 1000 ft.	100.00	List

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+20%
1/5 to std. pkg.	List
Std. pkg.	15%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+30% to List
1/5 to std. pkg.	+5% to 20%
Std. pkg.	18% to 36%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.45—$0.46	$0.45—$0.47
12 to 50	.40	.40— .41
50 to barrel	.35— .36	.36— .37
Barrel lots	.32— .329	.33— .339

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.45	$0.45
12 to 50	.38	.38 to $0.39
50 to barrel	.35 to $0.362	.35 to .372
Barrel lots	.326 to .332	.326 to .342

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
⅛	250	$5.00
¼	250	7.50
⅜	100	10.00
½	50	13.00
1	50	21.00
1¼	50	26.00
1½	25–50	35.00
2	25–50	45.00
2½	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less than Coil	Coil to 1000 Ft.
⅜-in. single trip	$75.00	$63.75— 69.75
⅜-in. double strip	75.00— 82.50	72.00— 75.00
½-in. single strip	100.00	85.00— 93.00
½-in. double strip	100.00—110.00	96.00—100.00

NET PER 1000 FT.—CHICAGO

	Less than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00	$63.25 to $63.75
⅜-in. double strip	78.25 to $78.75	71.25
½-in. single strip	100.00	75.00 to 85.00
½-in. double strip	105.00	93.00 to 95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
⅛	$0.05½	1	$0.25
¼	.06	1¼	.33
⅜	.09	1½	.40
½	.12	1¾	.47
⅝	.15	2	.55
¾	.18	2½	.65

NET PER 1000 FT.—NEW YORK

	Less than $15 List	$15 to $60 List	$60 to $150 List
⅛-in.—	$25.00	$18.00	$16.00
¼-in.—	30.00	19.50	17.50

NET PER 1000 FT.—CHICAGO

	Less than $15 List	$15 to $60 List	$60 to $150 List
⅛-in.—	$60.00	$30.00	$26.00–26.50
¼-in.—	65.00	32.00–32.50	29.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 40

Size, In.	Conduit, List per Foot
¼	$0.08½
⅜	.08½
½	.08½
¾	.11½
1	.17
1¼	.23
1½	.27½
2	.37½
2½	.58½
3	.76½

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
¼	$0.05	$0.19
⅜	.06	.19
½	.07	.19
¾	.10	.25
1	.13	.37
1¼	.17	.45
1½	.21	.50
2	.28	1.10
2½	.40	1.80
3	.60	4.80

DISCOUNT—NEW YORK

	¼ in. to ½ in.	¾ in. to 3 in.
Less than 2500 lb.	4% to 12.1%	6% to 14.1%
2500 to 5000 lb.	9% to 15.1%	11% to 17.1%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	¼ to ½ In.	¾ to 3 In.
Less than 2500 lb.	+3%	+1% to 2%
2500 to 5000 lb.	+1% to 2%	+4%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$7.00 to $7.50
Discount	25%

CHICAGO

List price	$6.35 to $7.50
Discount	20% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	30%
1/5 to std. pkg.	41%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	30%
1/5 to std. pkg.	40% to 41%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg.	$6.00 to $8.75
1/5 to std. pkg.	5.50 to 7.00

Standard packages, 500. List, each, $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg.	$8.00
1/5 to std. pkg.	7.00

Standard packages, 500. List each, $0.07

LAMPS, MAZDA OR TUNGSTEN

110 to 125 Volts

Regular, Clear:	Std. Pkg.	List Each
10 to 40-watt—B	100	$0.35
60-watt—B	100	.40
100-watt—B	24	.85
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 3½-in., Frosted		
15-watt—G 25	50	.60
25-watt—G 25	50	.60
40-watt—G 25	50	.60
Round Bulbs, 3½-in., Frosted:		
60-watt—G 30	24	.82
Round Bulbs, 4¾-in., Frosted:		
100-watt—G 35	24	1.15

DISCOUNT—NEW YORK

	List
Less than std. pkg	List
Std. pkg	10%

DISCOUNT—CHICAGO

	List
Less than std. pkg	List
Std. pkg	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$35.01–$35.18
Coil to 1000 ft	25.94– 29.17

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$30.00—$36.00
Coil to 1000 ft	21.00— 27.00

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$29.70 to $33.00

CHICAGO

Net per 100	$33.00

OUTLET BOXES

Nos.	List per 100
101—A, A 1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	26%–38%	20%–33%
$10.00 to $50.00 list	36%–47%	31%–43%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	20%–32%	10%–27%
$10.00 to $50.00 list	30%–40%	20%–35%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	10%
1/5 to std. pkg	20%
Std. pkg	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	10%
1/5 to std. pkg	20%
Std. pkg	30%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg	$15.00 to $22.40
1/5 to std. pkg	12.00 to 15.35
Standard package, 2200. List per 1000, $21 to $34	

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg	$21.00–$24.15
1/5 to std. pkg	17.85– 21.00
Standard package, 2200. List per 1000,	$20.00

PORCELAIN KNOBS

NEW YORK

Per 1000 Net.	Std. Pkg. 3500.	Std. Pkg. 4000
	5½ N.C.—Solid Nail-it—N.C.	
Less than 1/5 std. pkg	$13.60–$15.00	$22.00–$22.40
1/5 to std. pkg	10.50– 11.20	15.35– 18.00

CHICAGO

Per 1000 Net.	Std. Pkg. 3500.	Std. Pkg. 4000
	5½ N.C.—Solid Nail-it—N.C.	
Less than 1/5 std. pkg.	$13.00–$18.40	$32.00–$36.80
1/5 to std. pkg	11.50– 16.00	27.20– 32.00

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
½-in. cap key and push sockets	500	$0.33
½-in. cap keyless socket	500	.30
½-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	List
1/5 std. pkg	List to 10%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T	$0.80
60-amp. S. P. S. T	1.20
100-amp. S. P. S. T	2.25
200-amp. S. P. S. T	3.48
300-amp. S. P. S. T	5.34
30-amp. D. P. S. T	1.20
60-amp. D. P. S. T	1.78
100-amp. D. P. S. T	3.38
200-amp. D. P. S. T	5.20
300-amp. D. P. S. T	8.00
30-amp. 3 P. S. T	1.80
60-amp. 3 P. S. T	2.68
100-amp. 3 P. S. T	5.08
200-amp. 3 P. S. T	7.80
300-amp. 3 P. S. T	12.00
Low Grade:	
30-amp. S. P. S. T	$0.42
60-amp. S. P. S. T	.74
100-amp. S. P. S. T	1.50
200-amp. S. P. S. T	2.70
30-amp. D. P. S. T	.68
60-amp. D. P. S. T	1.22
100-amp. D. P. S. T	2.50
200-amp. D. P. S. T	4.50
30-amp. 3 P. S. T	1.02
60-amp. 3 P. S. T	1.84
100-amp. 3 P. S. T	3.76
200-amp. 3 P. S. T	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	+15%
$10 to $25 list	20%
$25 to $50 list	5%
	Low Grade
Less than $10 list	+5%
$10 to $25 list	8%
$25 to $50 list	15%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+25%+15%
$10 to $25 list	+10% to 20%
$25 to $50 list	+5% to 5%
	Low Grade
Less than $10 list	+15% to +5%
$10 to $25 list	2% to 8%
$25 to $50 list	5% to 15%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	70

SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List
Std. pkg	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+20% to list
1/5 to std. pkg	List to 10%
Std. pkg	8% to 23%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	18%–20%	List–18%
$2.00 to $10.00 list	28%–30%	5%–28%
$10.00 to $50.00 list	45%–50%	10%–47%

DISCOUNT—CHICAGO

	Galvanized	Black
Less than $2.00 list	25% to 40%	20% to 30%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 52%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00 to $7.00
Discount	25%

CHICAGO

List price	$6.35 to $7.00
Discount	20% to 30%

WIRE, ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.39–$0.41
No. 18, full spools	.35– .37

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.53 to $0.90
No. 18, full spools	.47 to .64

WIRE, RUBBER-COVERED, N. C

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$14.15–$14.50	$10.50–$12.65	$10.50–$10.60
12	$18.18	18.18	$13.64
10	24.30	24.30	16.20
8	33.12	27.60	22.08
6	52.50	43.75	35.00

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$17.50–$20.00	$9.50–$15.00	$9.50–$13.00
12	17.50– 21.63	17.55– 21.63	17.55– 18.54
10	24.05– 28.91	24.05– 28.91	21.16– 24.78
8	33.35– 39.34	33.35– 33.72	29.35– 33.72
6	52.95– 61.74	46.60– 52.92	46.60– 52.92

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb	$24.00–$29.25
25 to 50 lb	24.00– 25.25
50 to 100 lb	23.00– 23.25

CHICAGO

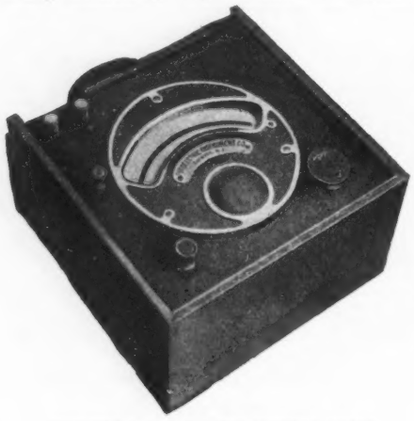
	Per 100 Lb. Net
Less than 25 lb	$23.75 to $35.75
25 to 50 lb	23.75 to 34.75
50 to 100 lb	23.75 to 37.35

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Continuously Deflecting Temperature Measurer

For accurately measuring temperatures up to 2200 deg. Fahr. (1200 deg. C.) with the use of a base metal couple, where it is desired to have a continuous indication without hand adjustment for each reading, the Northrup continuously deflecting "Pyrovolter" has been



CHECKS UP ITS OWN INDICATIONS

developed by the Pyroelectric Instrument Company, 636 East State Street, Trenton, N. J. It can be used for general base-metal calibration work when potential indications are desired. This instrument operates on the potentiometer principle applied in effect to a deflection instrument. The result is obtained by using the meter as a balancing galvanometer to balance a battery emf. against the unknown emf., then quickly changing connections by pressing a button to permit directly reading the fall of the potential against which the unknown emf. was just balanced. There is a second button on this instrument, which when depressed and locked down puts a small rheostat in series with the meter and the unknown emf., giving an indication on the meter, which is varied with the same rheostat knob with which the "Pyrovolter" balance was effected until the same deflection is obtained as that indicated in the second position of the balance method.

The meter supplied is of the low-resistance, double-pivot type, with jewel bearings. A metal cage shields it from stray magnetic fields. The pointer is of flat design, viewed on edge, with a mirror placed underneath to avoid errors due to parallax. The entire construction of the instrument is said to be unusually rugged to withstand the strains of portable, commercial use. Only one range is procurable in these pyrovolters — that of 0-60 millivolts. When desired this scale can be paralleled with a temperature marking for any metal-base couple.

Cabinet-Type Household Electric Range

The "Jewel" cabinet-type electric range recently developed by the Detroit Stove Works, 1320 Jefferson Avenue, East, Detroit, Mich., is equipped with a cooking top with four units, an oven and a broiler. The four cooking-top heating units are of the inclosed, sheathed-wire-element type. They are made by the General Electric Company, have three heats, are rated at 1000 watts and measure 8 in. (20 cm.) in diameter. The cooking top with the end shelf measures 28 in. (71 cm.) by 22 in. (56 cm.) and is of a size that eliminates crowding of cooking utensils.

Cooking top, oven and broiler heating units are all controlled from the switchboard and fuse box installed in front of the range below the cooking top. The seven three-way, 125-volt, 15-amp. switches are inclosed but have exposed dials which show when high, medium or low heat is being used. Separate fuses for each unit are placed just below the switches, a hinged door making them all easily accessible.

Soot-Cleaner Swivel Head

That it permits the easy turning of the soot-cleaner element by simply pulling a chain in either direction is the main feature of the soot-cleaner swivel head just put on the market by the Vulcan Soot Cleaner Company of Dubois, Pa. Other features are that it takes care of expansion and contraction of the connecting pipe line, does not leak steam and does not permit air infiltration.

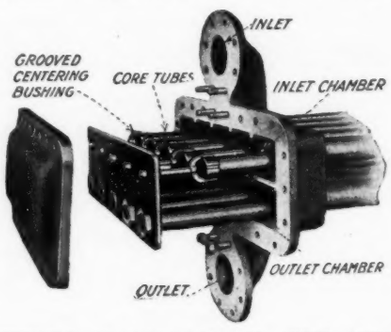
Steam from the boiler passes into the swivel head from the bottom through a vertical pipe, and thence into a horizontal element, which extends from the swivel head through the brick wall and into the setting. After the steam is turned on, the operator rotates the element slowly from one extreme to the other. Steam-turbine nozzles inserted in the element at proper spacings discharge the steam between the tubes in high-velocity jets, and in the course of rotation the tubes are freed from soot. The limitations of rotation are regulated by stops attached to the link chain. A pointer from one arm of the sprocket indicates the direction in which the steam jets are discharging.

To take care of expansion and contraction a gas-tight sliding joint is provided between the sprocket wheel and the metal housing that is mortared into the brickwork. As the vertical riser expands or contracts the swivel head moves up or down and the attached end of the element must, of course, follow. This is taken care of in the sliding, rotating swivel head, which is so designed that air inleakage is said to be impossible.

Steam-Agitating Superheater

Superheating is usually produced by "filming" or "sheeting" the steam through restricted annular passages or by breaking it up into small volumes, passing it through numerous tubes of restricted area, which sometimes causes increased friction with a corresponding drop in pressure. The Dravo superheater, now being marketed by the Superheater & Engineering Company, 233 Broadway, New York City, is built on the principle of agitating the steam as it passes through the apparatus, thus bringing every portion of the vapor into direct contact with the hot surface of the tubes and thereby producing a uniform degree of superheat.

Steam enters this superheater at the side or end of the header, as convenience dictates, and passes into the inlet chamber, then into an annular space between the tubes and core pipes of the ingoing elements, both by way of the grooves in the bushings and through the core pipes themselves. It then passes through the connecting pieces or return bends into the outgo-

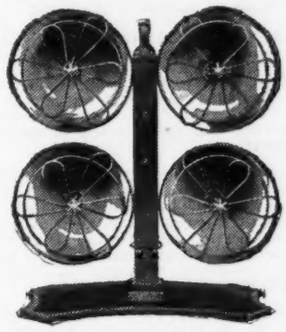


DETAILS OF MAIN HEADER WITH COVER REMOVED AND CORE TUBES DRAWN OUT

ing elements of the apparatus, reaching the annular space therein in practically the same manner as it reaches the ingoing elements. The superheated steam next goes through the outlet chamber to the side of the header, which is connected to the steam main.

Quadruple Radiant Heater

Similar in design to its twin radiant heater, as it has removable heating elements and guards and movable reflectors, but equipped with four units instead of two, the "American Beauty Quad" radiant electric heater has been brought out by the American Electrical



REFLECTORS ARE MOVABLE; HEATING ELEMENTS ARE REMOVABLE

Heater Company, Woodward, Burroughs and Cass Avenues, Detroit, Mich. It can be used as a portable heater or can be permanently mounted on a wall. Each of the heating elements is rated at 330 watts, making the combined wattage of the heater 1320. However, all four units need not be used at once, since one push-button switch controls the upper pair and another push switch controls the lower two heating elements. One important feature of this heater which the maker calls attention to is that heat may be sent in one or in several directions at the same time because of the movable reflectors.

Double-Throw Pole-Top Disconnecting Switches

Double-throw pole-top disconnecting switches are usually constructed so that they consist of two single-throw switches. One insulator carrying two sets of contacts is common to each switch. This arrangement requires two separate switching operations in order to transfer from one line to the other. The Electrical Engineers' Equipment Company of 710 West Madison Street, Chicago, has developed a double-throw switch which accomplishes this change-over in one complete operation. Moreover, the feeder can be disconnected from both lines and the switch blades remain in the neutral or open position, this being likewise accomplished by a single operation. The mechanism is arranged to lock in all three positions.

The switch is constructed by using a standard "Type 400" single-break switch manufactured by this company and adding a cross pipe which carries three additional insulators each being equipped with jaw contacts. An upward thrust or a downward pull on the operating pole, connected to a toggle mechanism, throws the switch to any position. The pipe base makes the switch very easy to install since it is not necessary to adhere to any fixed drilling dimensions as is the case when a channel-iron base is used. The insulators to which the lines are attached are rigid and do not swing or twist. Each switch is equipped with arcing horns and sleet hoods.

Portable Alternating-Current Galvanometer

The portable alternating-current galvanometer recently developed by the Leeds & Northrup Company of 4901 Stenton Avenue, Philadelphia, for use in alternating-current "balance" methods of measurement is claimed to have quick response to weak currents at commercial frequencies, and has a direct indication of the direction of unbalance. Its moving system resembles that of the direct-current portable galvanometer made by this company, being removable from the case; its sensivity closely approaches that of the corresponding direct-current instrument, and it is said to be just as convenient in use as that device. The particular applications of this galvanometer are to industrial measurements of electrolytic conductivities and to bridge methods of capacity and inductance at commercial frequencies.

Insulator Brackets with Oval Wire Holes

For service connections on poles and buildings insulator brackets with oval-shaped wire holes have just been put upon the market by the L. F. Engineering Company, 462 Hoboken Avenue, Jersey City, N. J., to accommodate duplex wires and consequently cut down the number of fittings necessary. The porcelain conical end pieces have corrugated interiors and grip the wires very securely; they are split in two sections and may be removed from the malleable-iron framework. A lag-screw-type insulator and bracket, which supports the wire 5 in. (12 cm.) from the surface, is one of the styles obtainable. The other three are a foot type, a double foot type supporting the wires 2 in. (5 cm.) from the surface, and a triple foot type which supports wires 3 in. (7 cm.) and 6¾ in. (16 cm.) from the surface.

Multi-Pole Plugs and Receptacles

The receptacles and plugs in three and four poles in 125-volt and 600-volt types recently announced by the Albert & J. M. Anderson Manufacturing Company, 289 A Street, Boston, which are known as "type A B C," have been designed to serve as flexible and quick-acting electrical connectors to motors and other apparatus. One important constructional feature of these devices is the self-aligning contacts, which are said to prevent undue binding and to insure a perfect connection between plug and receptacle. The contacts are equipped with removable cable sleeves, providing an easy and quick means of making soldered connections to cable. The current-carrying parts are embedded in individual members made of a non-conducting insulating compound which is said to have very high dielectric and great mechanical strength as well as extremely high heat-resisting properties. Reversing of polarity is impossible, since these plugs can be inserted into the receptacles only in the correct position.

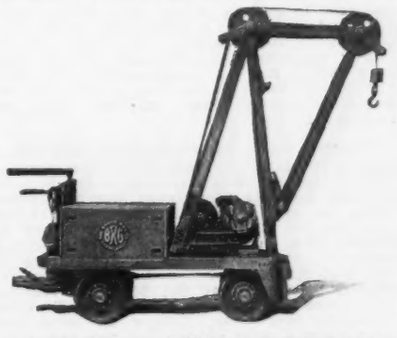
Bridge for Measuring Condenser Capacities

To measure condenser capacities rapidly and accurately a capacity bridge has been developed by the Leeds & Northrup Company of 4901 Stenton Avenue, Philadelphia, which is extremely simple to operate. The source of high-frequency alternating current, the telephone receiver and the unknown capacity are connected to the designated binding posts, the knob is turned until no tone is audible in the receiver, and the scale is then read and the reading multiplied by the standard capacity value.

Two self-contained mica standard condensers of 0.01 and 0.1 microfarad respectively enable accurate determinations to be made within this range, while a pair of extra binding posts permit the use of an external standard capacity of value above or below that range. The instrument is supplied with a protecting cover.

Crane-Equipped Industrial Truck

While developed primarily for picking up projectiles in shell plants and stacking them in piles, the crane-equipped electric industrial truck being marketed by the Baker R & L Company of Cleveland, Ohio, is said to be finding a large field of application in peace-time industrial plants. The truck, controlled from the customary platform,



WILL PICK UP 3000-LB. PROJECTILES

is driven by the motor supplied with energy from a heavy-type storage battery, and the hoist is operated through a double worm-reduction gear by the same power. The boom is movable, the illustration showing it in high position.

Trade Notes

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

A firm in Norway (No. 29,157) desires to purchase and secure an agency for the sale of electrical machinery. Credit to be open in New York through local banks.

A firm in Norway (No. 29,156) desires to purchase and to secure an agency for the sale of electric trucks. Payment, cash against documents at destination or at New York.

The representative of a firm in Denmark (No. 29,162) who is at present in this country desires to secure an agency and purchase electrical articles. Correspondence may be in English.

A firm in South Africa (No. 29,171) wishes to purchase two complete wireless telephone or telegraphic equipments for use between two mines located about 80 miles apart. Quotations should be given f.o.b.

A company in England (No. 29,143) wishes to purchase and secure an agency for the sale of electric motors for power purposes, ranging from 0.5 hp. to 50 hp., direct current, 460 volts and 230 volts, three-phase, 50 cycle, 400 volts, alternating. Payment, cash on delivery.

A firm in Spain (No. 29,179) desires to purchase high-pressure turbines and electrical machinery of all sorts for developing waterfall power in that country. Quotations should be given f.o.b. New York. Payment, cash against documents. Correspondence may be in English.

A firm in Norway (No. 29,106) which is building zinc smelting and refining works is in the market for twenty 1100-kva. and 10-kva. furnace transformers, together with oil switches and instruments, to be delivered as quickly as possible, f.o.b. New York. Payment to be made one-third with order, one-third upon delivery and one-third when erected, but not later than three months after second payment. Specifications may be seen at the Bureau or its district offices (refer to Exhibit No. 112,-357). Later the company will be ready to purchase a few storage locomotives, electric unloading cranes and other appliances and machinery for transporting raw material to the works and the finished product to the ship side.

BASIS OF AUSTRALIAN TARIFF ON ELECTRICAL IMPORTS.—The Australian overseas committee of the British Electrical and Allied Manufacturers' Association, according to a recent report in the *Electrical Review*, London, has been strongly urged that the basis of assessment of import duties should be altered from ad valorem to weight in the case of dynamos and motors and to a unit basis in the case of incandescent lamps. In the case of heavy machinery, particularly where time is required for its manufacture, the duty should be based on the cost at the time of contract rather than at the time of shipment.

LARGE VACUUM-CLEANER ORDER.—One of the largest single orders for vacuum cleaners on record is reported by the Hoover Suction Sweeper Company, North Canton, Ohio, in the sale of $182,000 worth of cleaners to the Sanger Brothers store in Dallas, Tex. Coming from the big selling center in the largest agricultural state in the Union, the order reflects the unparalleled prosperity of the farmer. Having experienced a record business in Hoover sweepers last year, Sanger Brothers are predicting a new sales peak for the coming year and are stocking up to fill their needs. Their order calls for 3200 cleaners for immediate delivery. According to F. M. Rhed, Southwestern sales manager for the Hoover company, the demand from agricultural states this year will be large. Mr. Rhed is in charge of Hoover sales in Missouri, Kansas, Colorado, Arkansas, Oklahoma, Texas, New Mexico and Louisiana. For the first three months of 1919 sales in this territory have been equal to almost one-half the total sales for the territory during the previous year.

PERU'S ELECTRICAL IMPORTS INCREASE.—Electrical supplies imported into Peru in 1916 amounted to $228,351, while in 1917 they increased to $664,219, a gain of 190 per cent.

TRADING WITH CHINA.—The Guarantee Trust Company of New York City has issued a pamphlet entitled "Trading with China," in which are set forth methods found successful in dealing with the Chinese.

BRITISH IMPORT RESTRICTIONS ON EDISON BATTERIES REMOVED.—The War Trade Board announces that all restrictions upon the importation of Edison cells and component parts for electrically propelled vehicles have been removed by Great Britain.

ONE PER CENT OF EXPORTS TO PHILIPPINES ELECTRICAL.—According to figures recently compiled by the National City Bank of New York, the electrical exports to the Philippine Islands from the United States amounted to 1.6 per cent of the total in 1916; 1.8 per cent in 1917 and 0.9 per cent in 1918. The amounts in the three years were: 1916, $379,930; 1917, $478,413; 1918, $443,667.

SWEDEN'S ELECTRICAL EXPORTS DECLINE.—For the four years, 1915, 1916, 1917 and 1918, Sweden's exports of electrical machinery and telephones were as follows:

	Electrical Machinery.	Telephones
1915	$1,618,720	$1,599,960
1916	3,008,032	2,088,524
1917	4,357,680	1,888,596
1918	1,926,652	1,516,612

RESTRICTIONS ON ELECTRICAL EXPORTS TO CENTRAL AND SOUTH AMERICA.—The War Trade Board announces that shipments of electrical generators over 20 kw., electrical motors over 25 hp., and electrical transformers over 50 kw. to Mexico, Cuba, Haiti, San Domingo or to any other country in Central or South America, excluding the colonies of Great Britain and France, will require an individual export license, as these articles do not fall within the provisions of Special Export License RAC-77, effective April 7.

BOX FOR EXPORTING ELECTRICAL INSULATORS.—A new type of crate for shipment of insulators for high-voltage transmission lines has recently been developed by the Forest Products Laboratory of the United States Forest Service at Madison, Wis. The work was done at the request of one of the large manufacturers of electrical goods whose containers had failed to prevent breakage of contents in spite of the apparent strength and durability of the container itself. The redesigned crates were subjected to severe tests and breakage of the insulators was eliminated. Moreover, it was stated, the container proved under test to be 100 per cent stronger, to occupy 15 per cent less space and to save 15 per cent in the cost of material. It is understood that this new type of package will be used to ship thousands of insulators to China for the construction of electric power lines.

BEAMA MAY LICENSE BRITISH ELECTRICAL IMPORTS.—At the annual meeting of the British Electrical and Allied Manufacturers' Association, according to a report in the London *Electrical Review*, the council took the view that none of the existing restrictions on imports of such electrical apparatus as instruments, accessories, heating and cooking apparatus and dry batteries should be removed at present, but that each application for permission to import should be considered as before on its merits, with no granting of leave to import without the fullest inquiry. This association has for some time exercised a government license controlling the import of supplies and essential accessories, and the report states that it is not impossible that the present negotiations will result in its becoming the general licensing authority for the whole trade, thus reasonably controlling the imports in accordance with proved necessity.

LEWIS JALOVEC has been appointed assistant to the United States Foreign Trade Commissioner to Czechoslovakia. He will be stationed at Prague, Bohemia. Information in regard to markets and information of any kind concerning the country where he will be stationed will be gladly furnished upon application. It is interesting that Mr. Jalovec is an engineer—one of the first to be appointed to such a governmental position.

THE ELECTRIC FURNACE CONSTRUCTION COMPANY, Finance Building, Philadelphia, reports the successful starting up of a special "Greaves-Etchells" type of electric furnace for the manufacture of corundum at the works of the William McGregor Company, Airdrie, Pa.

THE ELECTRIC PRODUCTS COMPANY, Cleveland, Ohio, announces the return of Capt. J. P. Lyons. Mr. Lyons will be district sales manager for New England, with temporary headquarters at the New York office of the Electric Products Company, 1328 Woolworth Building.

MAJOR ROWLAND TOMPKINS, A. E. F., formerly associated with Almirall & Company, Inc., New York City, has become a member of the Shevlin Engineering Company, Inc., 110 West Thirty-fourth Street, New York City, manufacturer and contractor for the installation of boiler-plant equipment.

CAPT. H. M. ST. JOHN, who left his position as research engineer in the testing department of the Commonwealth Edison Company, Chicago, to enter the gas warfare section of the United States Army, has been released from service and has become assistant manager of the Detroit Electric Furnace Company.

NORMAN HATTON, William J. Klein and S. E. Holmes, Masonic Temple, Cedar Rapids, Iowa, announce the formation of a partnership under the name of Hatton, Klein & Holmes. Their practice will be devoted to general engineering, architecture, machinery layouts, heating and ventilating and industrial engineering.

THE BLACK & DECKER MANUFACTURING COMPANY, Baltimore, Md., has just established a New York office in Room 2920, Equitable Building, which will be in charge of G. R. Lundane, who will supervise the distribution of Black & Decker products in New York City and surrounding territory, including the State of Connecticut.

THOMAS F. KELLEY has become associated with Titus Schmid of Dubuque, Iowa, in the organization of the Crescent Electric Company of that city. The new company will open a wholesale business in all kinds of electrical supplies. Mr. Kelley has represented the Central Electric Company of Chicago in the eastern Iowa field for a number of years.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY announces that its New York office has opened a separate warehouse with 2500 sq.ft. of floor space at 60 Vesey Street, where a complete line of material will be carried for New York distribution. The old quarters at 114 Liberty Street are being refitted as a modern office at which the business in New York City will be transacted as formerly.

THE BAILEY METER COMPANY, Cleveland, Ohio, announces that it has moved its main office and works from Boston to Cleveland, Ohio, effective May 1. The Boston office, with H. D. Fisher as manager, is retained to handle sales and engineering service work in the New England district. For the present the New York and Philadelphia districts will be covered from Boston, and all other districts will be covered from Cleveland.

THE ADAMS-BAGNALL ELECTRIC COMPANY, Cleveland, Ohio, announces the appointment of R. E. Uptegraff in charge of its transformer department. Mr. Uptegraff was with the Westinghouse Electric & Manufacturing Company seven years, where he had charge of turbine and switchboard operation and was connected with the manufacture of motors, generators and transformers and their accessories. He was also active in transformer designs. His five years with the Pittsburgh Transformer Company as assistant chief engineer were occupied with much transformer design. For two years Mr. Uptegraff was consulting engineer for Rutherford & Uptegraff, in which capacity he still acts, and during this time he redesigned and reorganized the transformer department of the Packard Electric Company.

R. W. VAN PELT, for the past two years in charge of Western sales of the insulated wire department of the B. F. Goodrich Company, Akron, Ohio, with headquarters in Chicago, has been promoted to charge of Eastern sales, insulated wire department, New York City headquarters. Mr. Van Pelt for a number of years was connected with the American Steel & Wire Company in a sales capacity for its insulated wire and cable department both

in the Chicago and the Pacific Coast offices. He joined the B. F. Goodrich Company in 1912.

EVAN J. EDWARDS is now devoting his time to industrial-plant engineering with the National Lamp Works of the General Electric Company at Cleveland, Ohio.

THE OHIO BRASS COMPANY, Mansfield, Ohio, announces that on May 1 its Chicago office moves from 508 Fisher Building to 1217 Fisher Building, 343 South Dearborn Street.

THE UNITED STATES LIGHT & HEAT CORPORATION, Niagara Falls, N. Y., is having plans prepared for the erection of a one-story and two-story addition to its plant on Highland avenue.

PURNELL O. WILSON, who for several years has been city salesman for the Montana Power Company at Great Falls, Mont., has been appointed manager of the Great Falls Electric Supply Company.

THE AMERICAN APPLIANCE COMPANY, New York City, announces the opening of an additional branch on Live Oak Street, Dallas, Tex. This office is in charge of Campbell Wood and will carry a complete line of tungsten lamps.

E. M. FAY of the Boston office of the Westinghouse Electric & Manufacturing Company has resigned in order to become sales manager for the E. W. Ham Company, Worcester, Mass., electrical jobber and distributer of Westinghouse apparatus.

THE COLWELL STORAGE BATTERY COMPANY, Waukegan, Ill., has purchased the Wetzel Building and will remove to the new location during the month of April. The building is 120 ft. by 130 ft., and the company will have the use of three floors.

C. R. WOOD will assume the management of the office of the Westinghouse Lamp Company in Cincinnati, Ohio, about May 1. For the past ten years he has traveled through Illinois, Iowa, Nebraska and South Dakota as salesman for the Westinghouse Lamp Company.

C. E. HAGUE, formerly production engineer of the Mid-West Engine Company, Indianapolis, Ind., has been appointed sales manager of the American Steam Conveyor Corporation, Chicago, manufacturer of the American steam ash conveyor and other ash-handling equipment.

THE CAPITAL ELECTRIC COMPANY, Salt Lake City, Utah, announces that R. W. Nicol, president, has sold his controlling interest in the company and severed all connections with it on account of ill health. H. D. Randall, formerly of the General Electric Company, has been elected president to succeed Mr. Nicol.

L. HAFT has become treasurer of the C. D. Wood Electric Company, 441 Broadway, New York City, in place of W. P. Ganson, resigned. The Wood company manufactures, imports and exports miniature lamps and novelties. C. D. Wood, president, has just returned from Switzerland, where he has been with the Y. M. C. A.

WILLIAM W. SOFFE, who for five years was manager of the Harter Electric Company, Chicago, and who later was in charge of the electrical department of the United States Shipping Board, Emergency Fleet Corporation, for the Great Lakes district, has become vice-president and general manager of the Inland Electric Company, Chicago.

THE AMERICAN STEAM CONVEYOR CORPORATION, Chicago, announces the appointment of Charles H. Florandin, formerly of the National Electric & Welding Company, New York, as general manager of its Eastern territory with headquarters at 110 West Fortieth Street, New York City. Mr. Florandin, who assumes charge of his new duties May 1, was born in France and received his technical education at the Lycée de Marseilles. He is an engineer by profession and upon coming to the United States did important work with the Brooklyn City Railway Company in the early days when the road was being electrified. After five years' service with this company he joined the C & C Electric Company, New York, and he held a responsible position with that firm for many years. After a brief connection with the Western Electric Company, he returned to the C & C Electric Company and later organized the National Electric & Welding Company. During the war Mr. Florandin was a member of the welding committee of the Emergency Fleet Corporation.

Trade Publications

GARAGE PUMPS. — Models P and W "master" garage pumps are described and illustrated in a leaflet from the Hartford Machine Screw Company, Hartford, Conn.

TAPES AND WEBBINGS.—The Mitchell-Rand Manufacturing Company of 18 Vesey Street, New York City, has got out a folder cataloging Hope electrical tapes and webbings.

HIGH-TENSION AIR-BREAK SWITCHES.—Bulletin No. 11 on high-tension air-break switches is the first of a new series of publications issued by Hickey & Schneider of Elizabeth, N. J.

STEAM AUTO TRUCK.—A new model of the "Steamobile" road truck is the subject of an illustrated booklet just issued by the Winslow Boiler & Engineering Company, 530 North Western Avenue, Chicago.

FARM-LIGHTING PLANTS.—The Superior Engineering Company, Jenkins Arcade, Pittsburgh, Pa., has issued a circular about its new lighting sets, which consist only of generator, switchboard and batteries.

STEAM TURBINES.—Bulletin No. 5 is being distributed by the Steam Motors Company, Springfield, Mass., to describe its "steam motor." The booklet is illustrated by a number of halftones and line drawings.

TWO-WAY PLUG.—The Benjamin Electric Manufacturing Company, 806 West Washington Boulevard, Chicago, has issued a new twenty-eight-page book to help dealers sell Benjamin two-way plugs in cartons of three.

HOUSE WIRING.—The Society for Electrical Development, 29 West Thirty-ninth St., New York City, has prepared an attractive illustrated folder that tells why houses should be wired for electricity and how clean, easy and quick the process is.

BRASS CASTINGS. — "Do-Di Finished Brass Castings" are the subject of a well-printed booklet just issued by the Doehler Die-Casting Company, Court, North and Huntington Streets, Brooklyn, N. Y. Many of these castings used in different machines are shown.

HEATING APPLIANCES.—The Hotpoint Division of the Edison Electric Appliance Company, 5660 West Taylor Street, Chicago, is distributing an elaborate colored broadside containing reproductions of its advertising material. A new price list effective April 1 has also been issued.

HOSPITAL LIGHTING. — The M. J. Grady Fixture Manufacturing Company, Minneapolis, Minn., has issued a thirty-two-page booklet showing its new designs in hospital lighting fixtures and featuring particularly the installation at one of the new hospitals in Minneapolis.

STORAGE BATTERIES.—Bulletin No. 55, on storage batteries for automobile starting and lighting and for ignition purposes, has been issued by the Universal Battery Company, 3410 South La Salle Street, Chicago. This company has also got out bulletin No. 50, which catalogs replacement parts for standard-make storage batteries.

LIGHTING PLANTS.—The Mathews Engineering Company of Sandusky, Ohio, has published a new catalog of its full-automatic lighting plants. The first section of the book presents the idea of more and better light for homes. The latter section contains information on the complete line of Mathews lighting plants. A number of interesting photographs illustrating the application of lighting plants by the government in France are included in this handsome publication.

STOKERS.—The Green Engineering Company, East Chicago, Ind., has issued a complete catalog covering its stoker and furnace equipment. Besides being well-illustrated, this book contains considerable engineering information, including cross-sectional drawings of settings for burning coal under various conditions, tables showing analyses of the coals of the world, information on stoker improvement, with particular reference to rear drums, chain skids, air-sealing systems, "Sealflex" arches and pressure waterbacks.

SOOT CLEANERS.—"Vulcan Soot Cleaners for Return-Tubular Boilers" is the title of a bulletin just published by the Vulcan Soot Cleaner Company, Dubois, Pa., to describe its model "M," front-end type, and model "R," rear-end type. The bulletin shows how these cleaners are installed in settings of typical construction. It gives the results of tests conducted by the engineering department of the University of Illinois and by the Iowa Soldiers' Home, at Marshalltown, Iowa.

New Incorporations

THE BEAUDETTE & GRAHAM COMPANY of Boston, Mass., has been incorporated by George C. Graham of Watertown, Joseph Beaudette of Boston, Harold L. French of Clinton, and Albert C. Gowing of Braintree.

THE ELECTRIC EQUIPMENT & SUPPLY COMPANY of Sandusky, Ohio, has been incorporated by R. C. Beebe, E. A. Bechstein, George J. Doerzbach, C. Webb Sadler and J. B. Arbour. The company is capitalized at $25,000.

THE AMERICAN DUPLEX SIGNAL COMPANY of Bridgeport, Conn., has been incorporated with a capital stock of $10,000 to manufacture automobile signal and signal devices. The incorporators are Andrew Simon, George H. Wood and Frank Pekar.

THE COLFAX (IND.) ELECTRIC COMPANY has been incorporated by George Davis, Homer R. Woodburn, Albertis D. Clark, Luther H. Perigo and Jerre B. Casey. The company is capitalized at $10,000 and proposes to generate and distribute electricity.

THE ARTHUR BOUDREAU COMPANY of New York, N. Y., has been incorporated by Arthur Boudreau, H. C. Beaver and F. Shultis, Jr., 16 West Sixty-first Street, New York City. The company is capitalized at $50,000 and proposes to manufacture electric motors, etc.

THE HALL RADIO CORPORATION, Union Station, Chicago, Ill., has been incorporated under the laws of the State of Delaware with a capital stock of $400,000 to manufacture wireless apparatus. The incorporators are Samuel C. Wood and A. D. Suess.

THE FARMERS' LIGHT & POWER COMPANY of Decatur, Ind., has been incorporated by Charles S. Mumma, B. Wolf, Louis F. Holle, C. D. Spuhler, Ross Harden and John D. Neidlinger. The company is capitalized at $5,000 and proposes to supply electricity in Decatur.

THE WIRELESS TRAIN CONTROL COMPANY of Terre Haute, Ind., has been chartered with a capital stock of $200,000 by Thomas G. and Harry W. Beggs, John T. and John H. Beasley and John F. O'Brien. The company proposes to manufacture railroad signal systems.

THE JOHN J. LEAHY ELECTRICAL SUPPLIES, INC. of New York, N. Y., has been incorporated by J. J. Leahy, T. L. Gorman, Jersey City, N. J., and P. J. McSweeney, 533 Tinton Avenue, New York City. The company is capitalized at $150,000 and proposes to deal in electrical supplies and devices.

THE ACME ELECTRO PLATING COMPANY, 64 Richmond Street, Toronto, Can., has been incorporated with a capital stock of $40,000. The new concern has taken over the plant and business of Walter E. Lewis and is planning to enlarge the building and install new equipment. Walter E. Lewis is president.

THE COCKADE CITY ELECTRIC COMPANY of Petersburg, Va., has been incorporated with a capital stock of $10,000 to do a general electrical and mechanical construction business. Mason Hill is president, J. J. Hall is vice-president and manager, and D. M. Barnes, R. F. D. No. 3, is secretary and treasurer—all of Petersburg.

THE MONTREAL ARMATURE WORKS, LTD., of Montreal, Que., has been chartered with a capital stock of $50,000 to take over the business of the Eastern Electric Company of Montreal, which manufactures electrical and mechanical appliances and tools, etc. The incorporators are Samuel D. Sweetman, Stanley H. Cunha, Philip J. Dolan and others.

New England States

SACO, ME.—Work has begun on a preliminary survey for the proposed development of the Cataract Falls in Saco by the Clark Power Company. If the plans are carried through, sufficient power will be developed to operate the mills of the company in both Biddeford and Saco.

WINN, ME.—The Penobscott Light & Power Company, recently organized, is planning to supply electricity for lamps and motors in Winn and Mattawankeag. The company is capitalized at $10,000. F. D. Sherrard is president and B. F. Wyman is treasurer.

MANCHESTER, VT. — The Equinox Spring Company of Manchester is planning to install electrically driven pumping machinery.

NEWBURY, MASS.—Plans are under consideration for the installation of a municipal electric light plant in Newbury.

NORWICH, CONN.—The Public Utilities Commission has approved the petition of the Shore Line Electric Railway Comrany for the erection of an electric transmission line from Montville, northerly, to the State line.

WATERBURY, CONN. — Ground has been broken for a power house, 80 ft. by 45 ft., for the International Silver Company.

Middle Atlantic States

BINGHAMTON, N. Y.—The Brewer-Tichener Corporation of Cortland is planning to install new equipment in the enameling department of its local works, including a new electrically operated oven and auxiliary apparatus.

NIAGARA FALLS, N. Y.—The John W. Cowper Company, Fidelity Building, Buffalo, has been awarded contract for the construction of the large addition to the plant of the United States Light & Heat Company at Niagara Falls. Mills, Rhines, Nordhoff & Bellman of Toledo, Ohio, are architects.

WATERTOWN, N. Y.—The Northern New York Utilities, Inc., is contemplating the erection of an electric transmission line from Watertown to Brownville, a distance of 6½ miles, replacing the present 3000-volt service with one of 22,000 volts.

ALLENTOWN, PA.—The City Council has engaged Frank Koester, consulting engineer and city planning expert, 50 Church Street, New York, N. Y., to make investigations and prepare a report on the installation of a municipal electric light plant in connection with the municipal waterworks. Mr. Koester recommends replacing the present arc-lamp-lighting system with nitrogen-filled tungsten lamps. It is estimated that a plant of 350-kw. capacity will take care of the present lighting system and provide for future extensions to the system. The cost of a municipal plant, including generators, transformers, wiring and street lamps, is estimated at less than $200,000.

EAST FREEDOM, PA.—Claar Brothers are contemplating enlarging the electric plant in their planing mill to supply electricity for lamps and motors in East Freedom.

HUNTINGTON, PA.—The board of trustees of Juniata College is having preliminary plans prepared for the construction of a power plant at the college, to cost about $25,000. G. Edwin Brumbaugh, Real Estate Building, Philadelphia, is architect.

PHILADELPHIA, PA.—A permit has been granted to Frank G. Stewart, 1610 Sansom Street, for the construction of a power house and stable on Twenty-fourth Street, between Ritner and Wolff Streets, for the city of Philadelphia.

PHILADELPHIA, PA.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 16, under Schedule 3959, for furnishing seventy-five 120-volt electric heaters at Philadelphia. Bids will also be received until May 23, under Schedule 3951, for furnishing miscellaneous electrical measuring instruments at Philadelphia. Application for proposal blanks should designate the schedule desired by number.

BALTIMORE, MD.—Plans are being prepared by the Chesapeake & Potomac Telephone Company for the erection of a new telephone exchange on Kate Avenue in the Park Manor district, to cost about $20,000.

CHARLESTON, W. VA.—The Kanawha Collieries Company is contemplating the construction of an electric power plant, 32ft. by 50 ft.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

North Central States

DETROIT, MICH.—Plans are being prepared for a new plant for the Yeomans Box Company of Detroit, consisting of a main building, 175 ft. by 225 ft., with building adjoining, 25 ft. by 85 ft., and also a boiler and engine plant, 25 ft. by 100 ft. Clarence W. Yeomans, 274 Wight Street, is interested in the company.

GRAND RAPIDS, MICH.—Bids will be received by Herbert N. Morrill, business manager, board of education, until May 16 for the construction of the new Henry School, including general construction, heating and ventilating, plumbing and sewering, electrical work, vacuum cleaning apparatus, etc. Plans and specifications are on file at the office of Henry H. Turner, 234 Division Avenue, North, Grand Rapids.

HOLT, MICH.—The Village Board is considering the question of lighting the village by electricity.

MARQUETTE, MICH.—Plans have been completed by Thomas W. Orbison, consulting engineer, Appleton, Wis., for a hydro-electric power plant to be constructed by Marquette County. The cost is estimated at about $140,000.

ONSTED, MICH.—The Village Council has voted to purchase the local electric light plant at $7,506.

SODUS, MICH.—The Benton Harbor & St. Joseph Railway & Light Company of Benton Harbor has submitted a proposition to the Council to furnish electricity for lighting the village. The company has offered to extend its service here, provided that the people interested would sell bonds for the company aggregating $1,000 per mile.

AKRON, OHIO—The B. F. Goodyear Rubber Company is contemplating the construction of a three-story machine shop and extensions, to cost about $93,000. The company is also planning the erection of a substation, to cost about $15,000.

CASTALIA, OHIO.—Arrangements are being made by the Castalia Portland Cement Company for equipping its electric plant for electrical operation. The plans provide for the installation of motors aggregating about 2000 hp., ranging from 10 hp. to 250 hp. Energy to operate the plant will be supplied by the Lake Shore Electric Railway Company.

HOLGATE, OHIO.—The Holgate Light & Power Company, recently incorporated, has taken over the municipal electric light plant and will supply electricity in the town and energy to operate the waterworks system. The company is capitalized at $20,000. W. P. Wallace, John F. Deatrick of Defiance and Thomas R. Wickenden of Toledo are among the incorporators.

LIMA, OHIO.—The franchise committee of the Council has approved the installation of an ornamental lighting system on Main Street from the Pennsylvania Railroad to the Ottawa River. The street-lighting service is furnished by the Lima Electric Railway & Light Company.

PORT CLINTON, OHIO. — The Council has authorized the installation of additional street lamps on the lake front.

SALEM, OHIO.—A bond issue of $200,000 for the installation of a municipal telephone system has been recommended to the City Council by the special committee.

SHERWOOD, OHIO.—Bids will be received by L. M. Kauffman, clerk of board of county commissioners, Sherwood, until May 12, for rebuilding and repairing the electric light plant and furnishing meters, lamps, etc.

TOLEDO, OHIO. — The Electric Auto-Light Company, it is reported, will build an extension to its plant.

WAVERLY, OHIO. — Bonds to the amount of $11,000 have been authorized for the installation of a new municipal electric plant to replace the present plant.

CATLIN, ILL.—The Council is considering issuing $35,000 in bonds to rebuild the municipal electric light plant.

CHICAGO, ILL.—The Hill Pump Valve Company is planning to erect a large plant at the corner of Belmont and Knox Avenues, the first unit of which will cost about $500,000.

ELDORADO, ILL.—The City Council is considering establishing a municipal electric light plant in Eldorado.

ELGIN, ILL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 20, for installing conduit and wiring and lighting fixtures in the post office at Elgin.

MASON CITY, ILL.—The Abbott Light & Power Company is contemplating erecting a number of rural electric transmission lines to supply electricity for lamps and motors to the farming districts.

ROCKFORD, ILL.—The Rockford & Interurban Railway Company is contemplating an issue of $105,500 in bonds for improvements.

ALTURA, MINN.—Steps have been taken to organize a company to install and operate an electric light plant in Altura, to cost about $300,000. For further information address the Power Engineering Company, Corn Exchange, Minneapolis, engineer.

RED WING, MINN.—At an election held May 28 the proposal to issue $350,000 in bonds for a municipal electric light plant was carried.

NEWTON, IOWA.—The City Council is considering the question of purchasing energy to operate the municipal electric system. Owing to the increasing demands for electrical service it will be necessary to enlarge the municipal plant or secure energy from outside sources.

WIOTA, IOWA.—Bonds to the amount of $5,000 have been authorized for the installation of a lighting plant.

HOLT, MO. — The Excelsior Springs (Mo.) Water, Gas & Electric Company has been granted a franchise to supply electricity in Holt. The company will extend its transmission line from Kearney to furnish the service here.

MARSHALL, MO.—All contracts have been awarded and work has begun on the installation of the new municipal electric light plant in Marshall.

MANDAN, N. D.—Bids will be received by the Board of City Commissioners at the office of the city auditor, Mandan, N. D., until May 15 for furnishing all material, including plant equipment and installing an ornamental street-lighting system. The proposed work covers approximately 80 blocks with 294 posts. Black & Griffin are engineers. W. H. Seitz is city auditor.

CLAREMONT, S. D. — Bonds to the amount of $10,000 have been voted for the installation of a municipal electric light plant in Claremont, S. D.

CUSTER, S. D.—The laundry, lighting and power plant at the State Tuberculosis Sanitarium was destroyed by fire recently, causing a loss of about $5,000.

GREGORY, S. D.—At an election held recently the proposal to issue bonds for the installation of a municipal electric light plant was carried. The cost is estimated at about $25,000.

PUKWANA, S. D.—At an election held recently bonds were authorized for the installation of a municipal electric plant in Pukwana.

CROFTON, NEB.—At an election held recently $10,000 in electric lighting and heating bonds were authorized.

ELLSWORTH, KAN.—The local electric light plant has been purchased by John Erber of Salina.

HOMINY, KAN.—The installation of an ornamental lighting system in the business district in Hominy is under consideration.

LARNED, KAN.—The Pawnee Power & Water Company has applied for permission to issue $50,000 in bonds for the erection of an electric transmission line to Burdette.

Southern States

SALISBURY, N. C.—The City Council has granted the Southern Power Company of Charlotte a franchise to supply electricity for lamps and motors in Salisbury.

MANNING, S. C.—The capital stock of the Manning Light & Ice Company has been increased from $15,500 to $20,000.

ATLANTA, GA.—The Georgia Railway & Power Company is contemplating an additional water-power development on Tugaloo River.

COLUMBUS, GA.—Plans are being considered to build a new power house and alter the present plant at the Eagle and Phoenix Mills on Front Street. Lockwood, Greene & Company, Healy Building, Atlanta, Ga., are engineers.

LUMBER CITY, GA.—The establishment of a municipal electric light plant in Lumber City is under consideration.

MOUNT VERNON, GA.—Plans have been perfected for the introduction of a bill at the forthcoming session of the State Legislature to amend the charter of Mount Vernon so as to permit the town to issue bonds to establish a municipal electric light plant.

SAVANNAH, GA.—Bids, it is understood, will soon be asked for electric wiring for the auditorium.

UVALDA, GA.—An election will soon be held to submit to the voters the proposal to issue bonds to establish a municipal electric light plant in Uvalda.

MIAMI BEACH, FLA.—Improvements are contemplated to the local system of the South Atlantic Telephone & Telegraph Company, to cost about $50,000. A new switchboard and underground conduits will be installed.

TALLAHASSEE, FLA. — Preparations are being made by the city of Tallahassee to rebuild the municipal electric light plant, recently destroyed by fire. The loss is estimated at about $75,000.

LEE VALLEY, TENN.—The installation of an electric light plant in Lee Valley is under consideration. John N. Adams is engineer.

ANNISTON, ALA.—Improvements to the electric street-lighting system are under consideration by the City Council.

SELMA, ALA.—The Selma Electric Railway Company, recently organized with a capital stock of $10,000, proposes to operate a traction system in Selma and vicinity.

LEXINGTON, MISS.—An election will be held May 15 to submit to the voters the proposal to issue $40,000 in bonds for the installation of an electric lighting system in Lexington.

SENATOBIA, MISS.—At an election held recently a bond issue was authorized to provide funds for improvements to the electric light plant and waterworks system. A crude-oil engine and other equipment, it is understood, will be installed in the power plant, and the electric lighting service will be extended to Coldwater, 6 miles distant.

ALTHEMIER, ARK. — Arrangements have been made by the town of Althemier with the Arkansas Light & Power Company to extend its service here from Stuttgart. The transmission line is practically finished.

ASHDOWN, ARK.—The electric plant of the Ashdown Light & Power Company was recently destroyed by fire, causing a loss of about $35,000. Arrangements have been made to install an electric generator at the local oil mill to furnish electricity for lighting. The plant, it is understood, will be rebuilt.

HUMPHREY, ARK. — A franchise has been granted to the Pine Bluff Light & Power Company to supply electricity in Humphrey. Work will begin immediately on the erection of a substation and transmission lines.

PRESCOTT, ARK.—The City Council is considering a proposal to supply electricity to the town of Gurdon, 10 miles distant. M. B. Morgan, owner of the plant in Gurdon, proposes to erect a high-tension transmission line from Gurdon to Prescott to secure energy to operate the system in the former city.

NEW ORLEANS, LA.—The New Orleans Petroleum Company is planning to equip an oil refinery in New Orleans, to cost about $1,500,000. The proposed equipment will include turbo-generators. The main offices of the company are located in the Woolworth Building, New York, N. Y.

YALE, OKLA.—A bond issue of $220,000 for public improvements has been approved by Attorney General Freeling. Of the total issue $100,000 will be used for extensions and improvements to the municipal electric light plant, $100,000 for waterworks extensions and $20,000 for the purchase of additional equipment for the fire department.

ALBANY, TEX.—Preparations are being made for the installation of a new light plant and ice factory in Albany.

HIGGINS, TEX.—The City Council has awarded a contract to C. L. Tennison to install an electric light plant in Higgins.

HILLSBORO, TEX.—The Texas Power & Light Company is contemplating erecting an electric transmission line from Hillsboro to Dublin to connect with the Brownwood system.

STRAWN, TEX.—The Texas Power & Light Company, it is reported, is contemplating the erection of a power station at Strawn to serve electricity to the Ranger and Duke fields.

PADUCAH, TEX.—An election will be called to submit to the voters the proposal to issue bonds for the installation of a municipal electric light plant and ice factory.

SNYDER, TEX.—The local electric light plant, owned by E. F. Renkin, has been purchased by Wilcox & Dunn of McKinney. Extensive additions will be made by the new owners to the plant and service.

Pacific and Mountain States

PORT ANGELES, WASH.—The Puget Sound Bridge & Dredging Company has awarded the contract for rebuilding the entire electrical machinery at its plant, recently destroyed by fire, to Thompson & Castleton, electrical engineers, 316 First Avenue South, Seattle. The equipment will include a 650-hp. motor and starting apparatus.

SEATTLE, WASH.—According to a report submitted to the City Council by F. C. Henny of Portland, Ore., and C. F. Uhden of Spokane, Wash., consulting engineers, construction of the Skagit River municipal power plant along the general lines suggested by A. H. Dimmock, city engineer, is feasible. The cost of the first unit is placed at $5,500,000, for which bonds have been sold.

SPOKANE, WASH.—The property of the Spokane Heat, Light & Power Company was recently sold at a receiver's sale for $400,000. The electrical equipment was purchased by F. C. Paine, local banker, representing Eastern interests, for $140,000; the remainder of the property was bought by E. P. Towhy, an attorney, for $250,000. The plant was erected in 1915 at a cost of about $2,000,000.

ASTORIA, ORE.—The Astoria (Ore.) Marine Works are planning to build a marine railroad, authorized some time ago by the Emergency Shipping Board, to cost about $500,000. All equipment will be electrically operated.

REEDSPORT, ORE. — The Reedsport Light & Power Company, recently organized, has awarded a contract to the Marshfield Electric Company to construct an electric plant and distributing system in Reedsport.

FRESNO, CAL.—Preparations are being made by the California Associated Raisin Company of Fresno for the erection of a new plant here, to cost about $750,000. Considerable electrical and mechanical equipment, conveyor systems, packing machinery, etc., will be installed. W. M. Giffen is president.

SAN BERNARDINO, CAL.—The construction of a new electric power plant to replace the one recently destroyed by fire is under consideration by the Yellow Pine Mining Company.

ST. GEORGE, UTAH.—The Dixie Power Company has filed application with the State Engineer for permission to take 25 second-feet of water from Santa Clara Creek at a point north of Foster in the Dixie National Forest. This will be diverted by means of a crib dam and carried 3½ miles in a canal and flume and utilized under a 314-ft. head with two 50-in. Pelton waterwheels, developing 712 hp. The company already has a plant on Santa Clara Creek.

FLORENCE, ARIZ.—Bids will be received at the office of the town clerk, Florence, until May 28, for improvements to electric light plant and waterworks system as follows: Section No. 1—For building main power plant, well houses and derricks, concrete reservoir, fuel-oil reservoirs, electrical and water distribution systems, hydrants and valves, steel tank and tower, foundations, etc. Section No. 2—Furnishing and erecting two 80-hp. boilers with stacks, oil-burning equipment and steam auxiliaries; two 80-hp. engines directly connected to 60-70-kva. alternators; two 300-gal.-per-minute motor-driven centrifugal pumps, switchboard, two 300-gal.-per-minute motor-driven centrifugal deep-well pumps, all piping and electric wiring complete. The town may decide to install oil engines for prime movers, or to buy power from an outside source, and desires bids upon alternate proposals as follows: Alternate No. 1—For furnishing one 80-hp. boiler with stack, oil-burning equipment and steam auxiliaries; one 80-hp. engine directly connected to one 60-70-kva. alternator; other equipment as specified under section No. 2. Alternate No. 2—For furnishing two 100-hp. compression ignition type, oil engines directly connected to two 60-70 kva. alternators; other equipment as specified under Section No. 2. Section 3—Cast-iron pipe and special castings. Section No. 4—For California redwood pipe and special castings. Plans and specifications are on file at the office of the town clerk, Florence, and at the office of Burns & McDonnell, engineers, Inter-State Building, Kansas City, Mo. Copies may be obtained from the engineers upon deposit of $15, of which $10 will be refunded upon return of same.

PRESCOTT, ARIZ.—The Arizona Power Company of Phoenix, which operates in Verde Valley, is extending its electric transmission lines to Phoenix, a distance of 70 miles.

RYEGATE, MONT.—The Public Service Company is planning to erect new telephone lines to cost about $40,000.

CARLSBAD, N. M.—The property of the Carlsbad Light & Power Company, it is reported, has been purchased by Chicago capitalists. The new owners will operate an ice factory and laundry. The dam will be enlarged and new machinery will be installed at the power house.

Canada

BOIESTOWN, N. B.—The installation of an electric plant, to cost $25,000, is under consideration. B. J. Thibedeau is reported interested.

CHIPPAWA, ONT.—Immediate action, it is understood, will be taken to secure electricity for lighting the village from the Ontario Hydro-Electric Power Commission.

CORNWALL, ONT.—The Toronto Paper Company is planning to install 1200 hp. at its plant. Electrical service will be supplied by the Hydro-Electric Power Commission of Ontario.

GUELPH, ONT.—The city of Guelph is considering an issue of bonds to extend the municipal electric railway from Hespeler north to Mount Forest.

PERTH, ONT. — Alterations are being made to the local power plants and transmission lines by the Municipal Council, which are later to be used in conjunction with the system of the Hydro-Electric Power Commission.

RIDGETOWN, ONT.—The Township Council has petitioned the Ontario Hydro-Electric Power Commission to extend its service to Ridgetown.

TORONTO, ONT.—The Ontario Hydro-Electric Commission is planning to construct a radial railway between Toronto and Port Perry.

WALKERVILLE, ONT.—The Maxwell Moore Company of Detroit, Mich., is planning to erect a plant in Walkerville, for which an appropriation of $1,000,000 has been made.

CHARLOTTETOWN, P. E. I.—Tenders will be received until May 13 for the construction of power house and laundry, Dalton Sanitorium, including plumbing and heating apparatus, East and West pavilions, Military Hospital, North Wiltshire, P. E. I. Plans and specifications can be seen and form of tender obtained at the office of the chief architect, Department of Public Works, Ottawa, Ont.; superintendent of military hospitals, Charlottetown; superintendent of Dominion buildings, Halifax, N. S., and of the overseer of Dominion buildings, Central Post Office, Montreal, Que.

CARTIERVILLE, QUE.—The Montreal (Que.) Tramways Company, it is understood, is planning to erect a new substation in Cartierville.

MONTMAGNY, QUE.—The city of Montmagny is considering the construction of a power plant, including dam, power house and electric line. Gauvin & Lessard of Quebec are architects.

THREE RIVERS, QUE.—The Canadian Pacific Railroad, Windsor Street Station, Montreal, it is understood, will soon ask for bids for equipping the branch line from Three Rivers to Shawinigan Falls and Grand' Mère for electrical operation. J. M. Fairburn is chief engineer.

VALLEYFIELD, QUE.—Contracts have been awarded by the Montreal Cottons, Ltd., for the installation of additional hydroelectric units at its works. R. S. Kelsch is consulting engineer.

HANLEY, SASK.—The Town Council is considering the installation of an electric light plant in Hanley. Murphy & Underwood, consulting engineers, Saskatoon, have been engaged to make a survey of the town and prepare an estimate of cost for the local government board.

MOOSE JAW, SASK.—A by-law authorizing an expenditure of $219,000 for the installation of a 3500-kw. turbine generator, line extensions, etc., has been passed by the ratepayers.

(Issued April 15, 1919)

1,300,319. CAR-DOOR SAFETY DEVICE; Anna K. Winter, New York, N. Y. App. filed Oct. 28, 1918.

1,300,320. CAR-DOOR SWITCH CONTROL; Anna K. Winter, New York, N. Y. App. filed Nov. 15, 1918.

1,300,326. TELEGRAPH SYSTEM; John H. Bell, East Orange, N. J. App. filed Oct. 29, 1917.

1,300,367. CIRCUIT BREAKER; Charles Le G. Fortescue, Pittsburgh, Pa. App. filed Oct. 31, 1914. Condenser terminal bushings decrease arcing.

1,300,373. DYNAMO-ELECTRIC MACHINE; George H. Garcelon, Swissvale, Pa. App. filed Jan. 21, 1916. Moisture-proof semi-inclosed motor.

1,300,387. SYSTEM OF CONTROL; Rudolf E. Hellmund, Pittsburgh, Pa. App. filed Sept. 8, 1914. Drum controller.

1,300,388. ELECTRICAL SYSTEM; Rudolf E. Hellmund, Pittsburgh, Pa. App. filed March 4, 1915. Prevents power from exceeding certain amount.

1,300,410. STEEL-MAKING PROCESS; Woolsey McA. Johnson, Hartford, Conn. App. filed May 3, 1915. Ferruginous lead reduced to iron.

1,300,420. PROCESS OF CONDUCTING ELECTROLYSIS; Ernest A. Le Sueur, Ottawa, Ont., Can. App. filed July 19, 1918.

1,300,431. BATTERY TERMINAL; Joseph O. Luthy, San Antonio, Tex. App. filed July 1, 1918.

1,300,440. RADIATOR HEATER; Chauncey L. C. Magee, Chicago, Ill. App. filed April 25, 1918.

1,300,483. RHEOSTAT; Edward Podsenick, Brooklyn, N. Y. App. filed March 28, 1916. Series resistance.

1,300,484. CIRCUIT CONTROLLER; Guy R. Radley, Milwaukee, Wis. App. filed March 30, 1914. For electric vehicles.

1,300,491. PAPER-PERFORATING MACHINE; John T. Schaaff, Washington, D. C. App. filed Nov. 17, 1916. For perforating record cards.

1,300,506. DYNAMO-ELECTRIC MACHINE; Charles W. Starker, Pittsburgh, Pa. App. filed Sept. 10, 1914. Made of pressed steel.

1,300,508. ARMATURE FOR DYNAMO-ELECTRIC MACHINES; Charles W. Starker, Pittsburgh, Pa. App. filed Oct. 30, 1916. Small weight for safety cars.

1,300,525. RECORDING MECHANISM; James C. Warren, Fredericksburg, Va. App. filed Oct. 15, 1917. For recording temperatures or pressures.

1,300,539. POLARIZED SIGNALING MECHANISM; Daniel S. Wilson, West Somerville, Mass. App. filed May 11, 1917. Alternating-current horn.

1,300,542. SERIES-MULTIPLE CONTROL; Ernst F. W. Alexanderson, Schenectady, N. Y. App. filed Jan. 29, 1914. Phase converters.

1,300,543. SYSTEM OF PHASE MODIFICATION; Ernst F. W. Alexanderson, Schenectady, N. Y. App. filed Feb. 23, 1917. Power factor of phase converter improved.

1,300,544. SYSTEM OF PHASE MODIFICATION; Ernst F. W. Alexanderson, Schenectady, N. Y. App. filed Feb. 23, 1917. Eliminates magnetizing current in stator windings of phase converter.

1,300,545. STARTING PHASE CONVERTERS; Ernst F. W. Alexanderson, Schenectady, N. Y. App. filed Jan. 29, 1914. Stabilizes series generator used as exciter.

1,300,546. GROUND DETECTOR; George E. Armstrong, Los Angeles, Cal. App. filed Dec. 27, 1915. Located in substation and sensitive to unbalanced current.

1,300,589. DYNAMO-ELECTRIC MACHINE; Joseph Le Conte Davis, Pittsburgh, Pa. App. filed July 29, 1913. High-voltage direct current.

1,300,603. ELECTRIC WELDING APPARATUS; James H. Gravell, Brooklyn, N. Y. App. filed Sept. 7, 1918. Uniform current-carrying contact.

1,300,637. MAGNETO FOR INTERNAL-COMBUSTION ENGINES; Richard A. Oglesby, South Bend, Ind. App. filed March 19, 1917.

1,300,665. SWITCH; Thomas E. Smith, Los Angeles, Cal. App. filed June 18, 1917. Actuated through single handle.

1,300,690. METER-TESTING CONNECTION; Carl H. Bissell and Harold P. Hastings, Syracuse, N. Y. App. filed Nov. 15, 1913. Meter connected in the feed circuit without interrupting current.

1,300,721. INTERCHANGEABLE TRANSMITTER CASING; Felix Gottschalk, Hilton, N. J. App. filed March 31, 1916.

Record of Electrical Patents

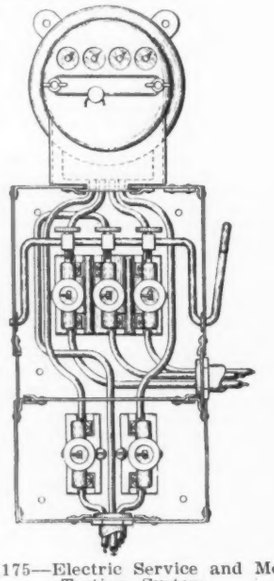
Notes on United States Patents

1,300,742. SYSTEM OF CONTROL; Benjamin G. Lamme, Pittsburgh, Pa. App. filed Jan. 5, 1915. Induction motor for frequency changers.

1,300,774. WEATHERPROOF PLURAL LAMP SOCKET; Adolph C. Recker, Oakville, Conn. App. filed June 16, 1917. Weatherproof.

1,300,779. TIMER BRUSH; John H. Richards, August J. Simon and John H. Haas, Overbrook, Kan. App. filed July 10, 1918.

1,300,789. CAR AND ELECTRIC COUPLING DEVICE; Charles H. Tomlinson, Mansfield, Ohio. App. filed June 10, 1914. Live contacts protected.



1,301,175—Electric Service and Meter-Testing System

1,300,812. ATTACHMENT PLUG; Reuben B. Benjamin, Chicago, Ill. App. filed March 15, 1915. Easily assembled.

1,300,827. ELECTRIC LIGHTING FIXTURE; Garry J. Dormandy, Troy, N. Y. App. filed June 28, 1917. For workbench.

1,300,855. ELECTRIC SWITCH; Don A. Munger, Detroit, Mich. App. filed May 28, 1917. Coil of automatic switch is inclosed in iron case.

1,300,859. COIL-RETAINING DEVICE AND METHOD OF ASSEMBLING THE SAME; John P. Nikonow, Wilkinsburg, Pa. App. filed Dec. 26, 1913. Strong support of few parts.

1,300,890. NAVIGATIONAL INSTRUMENT; Elmer A. Sperry, Brooklyn, N. Y. App. filed Feb. 3, 1915. Accurate readings may be transmitted to other instruments.

1,300,922. IGNITER; Phelps Brown, Springfield, Mass. App. filed April 9, 1917.

1,300,970. ENGINE STARTER; Edward S. Huff, Detroit, Mich. App. filed Nov. 16, 1914.

1,301,002. MAGNETO COUPLING; Ralph H. Pierce, Eugene, Ore. App. filed Aug. 29, 1918.

1,301,009. FUSE PLUG; Ralph A. Schoenberg, New York, N. Y. App. filed Nov. 11, 1914. Indicates whether fuse has been blown.

1,301,011. THERMOSTATIC ALARM; Floyd L. Scoutten, East Cleveland, Ohio. App. filed March 19, 1915. For furnace flues.

1,301,014. ELECTRIC DRIVE FOR GYROSCOPES; Elmer A. Sperry, Brooklyn, N. Y. App. filed Feb. 9, 1915. Avoids use of starting box.

1,301,050. ELECTRIC MOTOR; Edwin V. Hagman, Boston, Mass. App. filed May 13, 1914. Device for inching motor.

1,301,053. IGNITION DEVICE FOR MOTOR VEHICLES; John A. Heany, Jersey City, N. J. App. filed July 27, 1910.

1,301,077. ELECTRICAL GENERATOR; William D. Pennington, French Lick, Ind. App. filed April 12, 1906. Auxiliary electromagnets on field yoke.

1,301,079. INCANDESCENT LAMP; William L. Van Keuren, North Bergen, N. J. App. filed June 15, 1918. Molded insulating material used for base.

1,301,080. ELECTRIC SYSTEM; John L. Creveling, Auburn, N. Y. App. filed May 21, 1915. Automatic operation of batteries floating on line.

(Issued April 22, 1919)

1,299,057. SIGNAL; Edwin L. Storer, Tulsa, Okla. App. filed Aug. 10, 1917.

1,301,088. MOTOR CONTROLLER; Thomas E. Barnum, Milwaukee, Wis. App. filed Jan. 12, 1915. Self-starter for elevator or printing press.

1,301,135. FIXTURE FOR USE WITH MAGNETIC CHUCKS; Samuel Karasick, New York, N. Y. App. filed March 28, 1917.

1,301,152. LAMP SOCKET; Milton W. Morse, Mount Vernon, N. Y. App. filed Aug. 3, 1916. For two-filament lamp.

1,301,175. ELECTRIC SERVICE AND METER-TESTING SYSTEM; Joseph Sach, Hartford, Conn. App. filed May 11, 1915. Service connection appliance, placed so as to be accessible only to the authorized person.

1,301,206. ELECTRIC LIGHTING SYSTEM; Dana E. Wescott, South Bend, Ind. App. filed March 31, 1916. Plurality of lamp circuits controlled from a central station to extinguish the lamps simultaneously.

1,301,212. AUTOMOBILE SIGNALING DEVICE; George W. Albright, Kansas City, Mo. App. filed March 9, 1917.

1,301,213. DUPLEX PRINTING-TELEGRAPH SYSTEM; Charles G. Ashley, Toronto, Ont. App. filed May 7, 1917.

1,301,222. SWITCH GOVERNOR; Adolf M. Bruss, Central Butte, Saskatchewan, Canada. App. filed April 12, 1917.

1,301,227. VARIABLE RESISTANCE; Theodore W. Case, Scipio, N. Y. App. filed Oct. 9, 1917. Resistance diminishes as the intensity of the light to which it is exposed increases.

1,301,231. ELECTRIC REGULATION; John L. Creveling, New York, N. Y. App. filed July 21, 1911. For constant voltage.

1,301,233. ELECTRIC VULCANIZER; Oliver C. Dennis, Wilmette, Ill. App. filed March 6, 1917. Flexible cord protected.

1,301,239. RAIL BOND; Harold H. Febrey, Newark, N. J. App. filed Aug. 7, 1917.

1,301,246. RECEIVER FOR WIRELESS SIGNALS; Charles S. Franklin, London, Eng. App. filed Feb. 26, 1919.

1,301,253. PORTABLE ELECTRIC LANTERN; William Grether, Dayton, Ohio. App. filed July 9, 1917. Watertight.

1,301,279. METHOD OF AND MEANS FOR CONTROLLING ELECTRICAL ENERGY; Irving Langmuir, Schenectady, N. Y. App. filed Nov. 20, 1914. Large variations in the amplitude of the current may be produced.

1,301,331. ELECTRODE FOR ARC WELDING; Reuben S. Smith, Milwaukee, Wis. App. filed Dec. 6, 1918. Slag is not formed.

1,301,334. ELECTRICITY TRANSFORMING AND CONVERTING APPARATUS; Henry R. Summerhayes, Schenectady, N. Y. App. filed May 7, 1917. Rotatable transformer, synchronous converter and booster.

1,301,347. WELDER'S TOOL; Roy O. Williams, Columbus, Ohio. App. filed Feb. 24, 1919. Effects support and manipulation of a welder's electrode.

1,301,363. TELEPHONE SYSTEM; Sidney A. Beyland, Rochester, N. Y. App. filed Sept. 28, 1914.

1,301,396. TRAFFIC SIGNAL; William A. Dau, Detroit, Mich. App. filed April 19, 1916.

1,301,412. ELECTROMAGNETIC DEVICE; Gustaf W. Elmen, Bogota, N. J. App. filed Oct. 10, 1917. For telephones.

1,301,425. DIRECT-CURRENT SIGNALING SYSTEM; Benjamin F. Gardner, Chicago, Ill. App. filed Nov. 24, 1917.

1,301,434. ELECTRIC METER; Edwin J. Heitman, Philadelphia, Pa. App. filed June 14, 1917. Closing cover damps needle automatically.

1,301,456. SOCKET FOR INCANDESCENT LAMPS; Oscar Kupferman, Brooklyn, N. Y. App. filed April 6, 1917. Easily disassembled key socket.